

REPORT

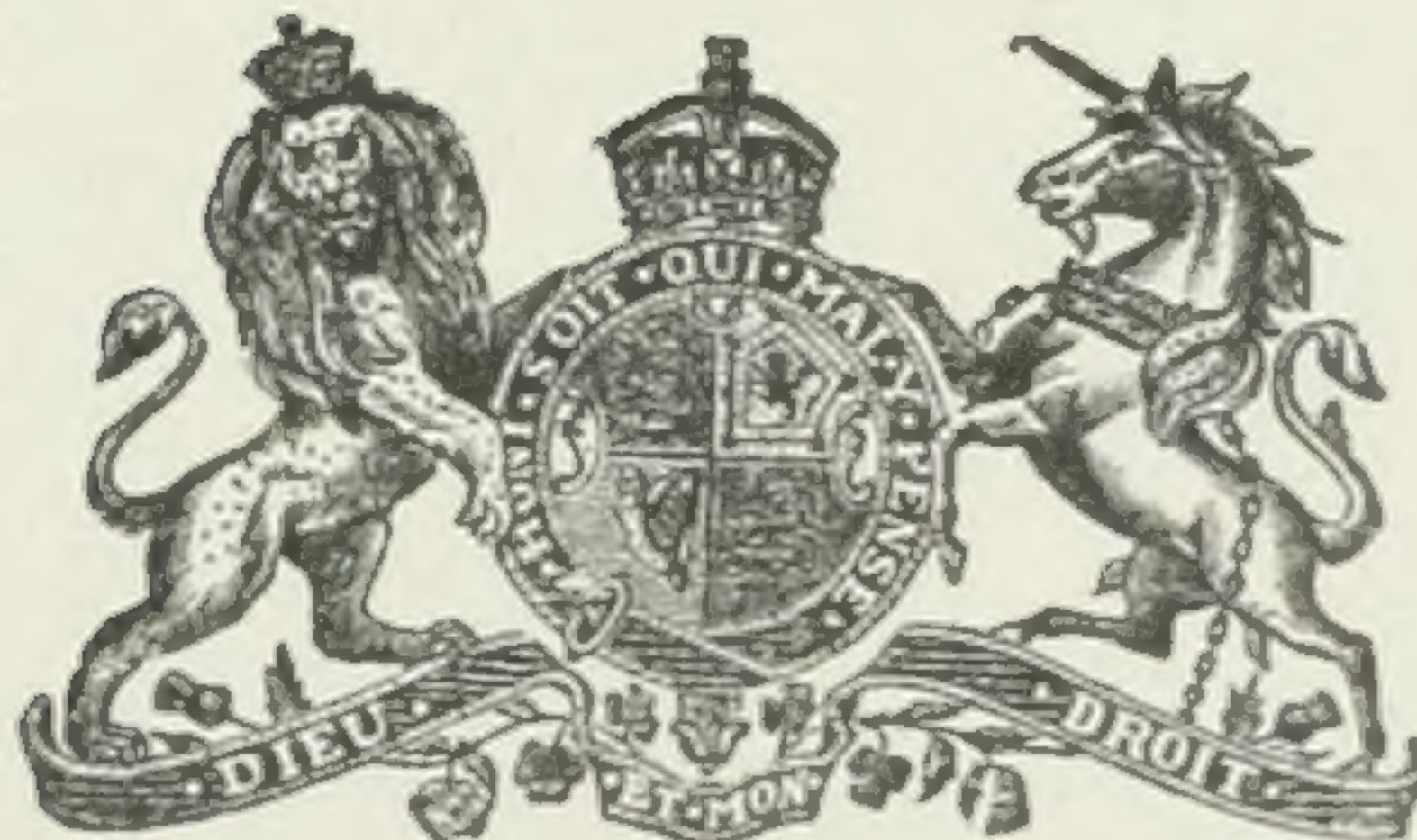
OF THE

DEPARTMENT OF THE NAVAL SERVICE

FOR THE

FISCAL YEAR ENDING MARCH 31, 1913

PRINTED BY ORDER OF PARLIAMENT



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EXCELLENT MAJESTY

1913

[No. 38—1914.]

To His Royal Highness, Field Marshal, Prince Arthur William Patrick Albert, Duke of Connaught and Strathearn, K.G., K.T., K.P., etc., etc., etc., Governor General and Commander-in-Chief of the Dominion of Canada.

MAY IT PLEASE YOUR ROYAL HIGHNESS:

I have the honour to submit herewith for the information of Your Royal Highness and the Parliament of Canada, the Third Annual Report of the Department of the Naval Service, being for the year ended March 31, 1913.

I have the honour to be,

Your Royal Highness's most obedient servant,

JOHN DOUGLAS HAZEN,
Minister of the Naval Service.

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REPORT
OF THE
DEPARTMENT OF THE NAVAL SERVICE
FOR THE
FISCAL YEAR ENDING MARCH 31, 1913.

OTTAWA, June 1, 1913.

The Honourable J. D. HAZEN,
Minister of the Naval Service,
Ottawa.

SIR,—I have the honour to report on the Department of the Naval Service for the year ending March 31, 1913, under the following headings:—

- | | |
|------------------------------|-------------------------|
| 1. Naval. | 4. Hydrographic Survey. |
| 2. Fishery Protection. | 5. Radiotelegraphy. |
| 3. Tidal and Current Survey. | |

1.—NAVAL BRANCH.

The progress of the Cadets at the Royal Naval College at Halifax still proves most satisfactory.

Nineteen Cadets completed their two years' course at the College in December, 1912; through the courtesy of the Admiralty, arrangements were made for the papers for the passing-out examination to be set and marked by the Admiralty officials; a quite independent report on the results of training at the College was thus obtained, and the results proved eminently satisfactory; all the Cadets passed, and the examiners were most favourably impressed with their abilities, which they considered showed careful training at the College. These Cadets are now undergoing a year's sea-going training in H.M.S. *Berwick*, a Royal Navy Cruiser attached to the Fourth Cruiser Squadron, the Admiralty having courteously arranged to accommodate them and undertake their training.

A further examination for the entry of Cadets at the College was held in November 1912, ten candidates qualifying, of whom eight joined the College in January. There are now seventeen Cadets under training at this College.

The Officers of the College report most favourably on the behaviour of the Cadets, who have proved themselves most amenable to discipline, and display great keenness in the profession for which they are undergoing training.

It has been decided to hold future examinations for entry in May instead of in November; this coincides better with the school year, and it is also considered more advantageous to commence the training at the College in the summer. The next examination will be held in May 1913, the successful candidates entering the College about 1st August.

Of the officers undergoing training in the British Fleet, the six Engineer Sub-Lieutenants have all qualified for and been promoted to Engineer Lieutenants; of the

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six Midshipmen, one has been invalided out of the service for defective eyesight, the remainder have qualified in Seamanship for the rank of Lieutenant, obtaining first-class certificates; they have been promoted to the rank of Acting Sub-Lieutenant, and are now studying at the Royal Naval College, Greenwich, England, the subjects necessary to complete their examination for rank of Lieutenant.

No recruits have been entered in the Ships since October last.

H.M.C.S. *Niobe* is now in an efficient sea-going condition, her repairs having been completed in December; on account of the deficient complement however, the Ship is not able to undertake prolonged cruises.

The training of recruits has been continued as far as circumstances will admit, and a party of Able Seamen has been sent to England to qualify for Seaman Gunner, and in higher Gunnery ratings.

H.M.C.S. *Rainbow* has made various cruises on the coast of Vancouver island; the reduced complement on board only now permits of cruises of short duration to keep the ship in an efficient condition.

The C.G.S. *Earl Grey* was commissioned in July 1912, under this Department by Officers and men of the Royal Canadian Navy for the purpose of conveying His Royal Highness the Governor General on a cruise round the gulf of St. Lawrence and the Maritime Provinces. On completion of the cruise the vessel was returned to the Department of Marine and Fisheries.

The health of the Navy has been generally satisfactory.

The report of the Director of the Naval Service on the Naval Branch is appended at page 19.

NAVAL BRANCH—DOCKYARDS.

DOCKYARD WORK, ORGANIZATION, ETC.

The organization and administration of the Dockyards at Halifax and Esquimalt has been continued during the financial year 1912-13, under the Department of the Naval Service, and, in addition to the upkeep of the Establishments in accordance with the conditions of transfer from the Admiralty, a great deal of work has been undertaken in connection with the repairs necessary to *Niobe*, the vessels of the Fishery Protection and Hydrographic Survey attached to the ports, and repairs have been effected in accordance with requisitions on other Government steamers and Imperial ships.

Some additional machine tools of a special nature have been purchased for both Dockyard Establishments, in accordance with the amounts provided in the programme for the year, with a view of facilitating the work of repairs to machinery, but the nature and extent of the workshops is not such as will admit of installing modern tools and equipment, and consequently no complete scheme for reorganizing the repair shops has been considered.

The capacity of these Yards is practically limited to the small repair work which is now being carried out; the output from a manufacturing point of view is also small, being limited to the construction of boats and lighters, and the production of small articles required as stores, and which are special to the Naval Service.

The age and construction of the shops and stores at Halifax has been previously referred to and further expenditure has been necessary during the year in order to keep them in an efficient condition, the proportion of expenditure on the upkeep of the establishment being large in comparison with the useful output.

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It will also be understood that as the Establishment is not only a repair shop but is a store establishment for the Naval Service, the Establishment charges are therefore high in view of the limited amount of work which can be accomplished.

The number of men employed is small and is limited to that absolutely necessary to cope with the repairs provided for, and, as, in order to keep the existing machinery and plant in an efficient condition, it is better to keep it working, it is considered that although the working expenses may appear comparatively high, the utilization of the plant for repairs to Government vessels is the best means of maintaining efficiency, and from the comparisons made in particular cases of the cost of work if carried out in outside establishments, it appears that economy is effected in expenditure.

It has been found, especially at Esquimalt, that repairs to the small Imperial ships on that station can be more conveniently and economically carried out in the Naval Yard, and the Commanding Officers of the vessels have favourably reported on the character of the work done, and the rapidity of execution.

These Dockyards have to be kept going as Naval Establishments from the store point of view; coal has to be stored for the Imperial vessels in accordance with conditions of transfer from the Admiralty, which means that arrangements have to be made for administration, upkeep, etc., in any case, and it is considered, in view of the favourable reports received on the work done, that it is most desirable to fully utilize the workshops and plant for such repairs as can be effected.

WORK AND EXPENDITURE AT THE DOCKYARDS DURING CURRENT YEAR.

Regarding the general nature of the work carried out during current year, the following remarks are offered. The administration and work is being carried out on the lines previously approved by the department.

The average weekly wages bill at the two Yards was:—Halifax, \$1,820; Esquimalt, \$976.

A large part of this amount is recoverable, being performed for other departments of the Government, and it also includes work done for the Imperial Service, and wages paid in connection with the management and handling of stores for the Service under consideration.

The wages paid are generally in accordance with the fair wage schedule of the Labour Department, modified slightly to meet the relative importance of the various trades in a ship repairing and engineering establishment.

The principal items of work which have been carried out at the two Dockyards during the year are as follows:—

HALIFAX.

Niobe.—In connection with the repairs to this vessel, the Dockyard Staff undertook the repairs and renewals of the wood and copper sheathing of the hull, the structural work being completed by the Halifax Dock Company; other necessary repairs to valves and piping, dynamo electric machinery, the main machinery and boilers, the capstan and steering machinery, and general repairs incidental to upkeep have also been completed during the year.

The refits of the machinery and repairs to hull have been completed in connection with the Fishery Protection vessels *Curlew*, *Petrel*, *Constance* and the Tidal Survey vessel *Gulnare*, the repairs to the latter vessel including the retubing of the boilers.

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A considerable amount of work has been carried out in the *Armstrong* and *Alfreda*, vessels belonging to the Militia Department, including the fitting of new furnaces to the boiler of the former vessel. Repairs have been executed to the launches of the Hydrographic Survey and the schooner *Burleigh*, and C.G.S. *Minto* attached to that branch.

A winter refit of the Fishery Cruiser *Canada* was carried out which involved the fitting of new gun pedestals, davits for boats, a wireless telegraphy installation, structural alterations and a refit of the machinery and boilers.

Various items of work have been carried out as requisite for the Department of Marine and Fisheries, chiefly in connection with the electrical installation of vessels attached to that department.

Incidental work in connection with the making of mine-sweeping gear for the *Constance* and *Petrel*, and a boom defence for the Graving Dock, has also been completed.

Other work undertaken chiefly comprises that in connection with the upkeep of the Establishment and the College, the painting and general maintenance of the Yard buildings and stores, the conversion of Nos. 1, 2 and 3 houses into offices suitable for the administration of the Yard and to accommodate the staff required, the building of some boats for the Naval Service, the completion of a new coal store, and the manufacture of a number of special articles required as stores for the Naval Service.

ESQUIMALT.

At this Yard the refits of the hull and machinery of the following Government vessels have been carried out during the year, and incidental defects made good as they have arisen: *Quadra*, *Falcon*, *Restless* and *Lillooet*. Various necessary repairs have been completed to H.M.C.S. *Rainbow*.

The most extensive job completed was a refit of the hull and machinery of H.M.S. *Shearwater*, carried out for the Admiralty on repayment, and which involved considerable work, including the re-tubing of the boilers.

Incidental repairs in connection with the upkeep of the Establishment and repairs to buildings have also been completed by the Yard Staff, and the handling and issue of stores for the Government and Imperial vessels.

2.—FISHERY PROTECTION.

The following vessels were employed on Fishery Protection Service during the past year in the districts named:—

Canada.—Coast of Nova Scotia and gulf of St. Lawrence.

Petrel, *Constance*.—East coast of Nova Scotia.

Curlew.—Bay of Fundy.

Vigilant.—Great Lakes.

William Jolliffe, *Restless*, *Falcon*, *Newington*.—Pacific Coast.

A continuous patrol was maintained by the above vessels during the fishing season for the protection of the fisheries.

The *William Jolliffe* is a chartered vessel, but two vessels are now under construction by the Dublin Dockyards Company, Ireland, for Fishery Protection service on the West Coast, and will be on their station during next season.

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The *Canada*, in addition to Fishery Protection duties, has been employed for the training in Gunnery of classes from H.M.C.S. *Niobe*; alterations have been made in the vessel to render her more efficient, and the armament has been improved by installing two 12-pdr. 12 cwt. Q.F. guns and two 3-pdr. Q.F. guns in place of the four 1½-pdr. guns with which she was originally armed.

Very little illegal fishing was met with.

The lobster catch during the open season is reported as fairly successful, and slightly above the average; the spring catch of mackerel by the American seining fleet was a complete failure. In the fall, the catch was good on the Cape Breton coast, but a complete failure on the coast of Nova Scotia.

The report from the Great Lakes states that very little poaching was carried on, and Canadian fishermen had a good season.

On the West Coast the vessels kept up a vigilant patrol, and various ships were reported for contravening regulations and were fined, three seizures being made.

The vessels of the Fishery Protection service were able, on various occasions, to render assistance to vessels in distress.

The report of Rear Admiral C. E. Kingsmill on the Fishery Protection Service, is appended at page 26.

3.—TIDAL AND CURRENT SURVEY.

The work of the Tidal and Current Survey has been maintained during the year by means of the various tidal stations on both coasts, and also on board the C.G.S. *Gulnare*, which vessel operated in the Gaspé region.

There are six tidal stations in Eastern Canada, and five on the Pacific Coast.

The valuable information obtained is embodied in the Tidal Tables, the demand for which is continually on the increase.

The report from Dr. Bell Dawson, Superintendent of the Tidal and Current Survey, is appended at page 35.

4.—HYDROGRAPHIC SURVEY.

The Hydrographic Survey work, in charge of Mr. W. J. Stewart, Chief Hydrographer, continued to make satisfactory progress during the year, under the following divisions, viz.:—

- | | |
|------------------------|---------------------------|
| 1. Lake Superior. | 6. Hudson Bay (magnetic). |
| 2. Lake Ontario. | 7. James Bay. |
| 3. Lower St. Lawrence. | 8. St. Lawrence River. |
| 4. Pacific Coast. | 9. Automatic gauges. |
| 5. Hudson Bay. | |

The work in lake Superior was in charge of Mr. Charles Savary, who conducted the survey from the steamer *La Canadienne*, which had undergone considerable repairs.

Caribou island was traversed, that portion of the lake from Copper island to Lamb island was surveyed, and the new lighthouse on Michipicoten island was connected up with the United States Lake Survey Triangulation stations. Later on, a

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survey of Little Current in North Channel, Lake Huron, was carried out, and during the season much other useful work was performed.

The Lake Ontario survey was in charge of Mr. Bachand, in the steamer *Bayfield*. Much triangulation, traversing and sounding was carried out, which will enable large scale plans of Bond Head harbour, Port Darlington and Port Whitby to be completed.

The work in the lower St. Lawrence was carried out by Commander I. B. Miles, R.N., (Retired), operating from the steamer *Cartier*. Triangulations, traversing and sounding were carried out in the vicinity of Ste. Flavie on the south shore, and Cape Columbia on the north, to which point the re-survey of the lower St. Lawrence is now complete from the westward.

The Hydrographic Survey work on the Pacific Coast was in charge of Captain P. C. Musgrave, being conducted from the steamer *Lillooet*. The survey of Granby bay and its approaches was first completed and then of Pacofi, Selwyn inlet, Queen Charlotte island. The triangulation and sounding of Hecate strait was then continued, deep-sea sounding to the westward of Dixon Entrance carried out, and later the Coast Triangulation of Graham and Moresby islands, and triangulation and coastline of Skidegate Inlet was concluded. Much useful work in other directions was also carried out.

Three parties were sent to Hudson bay, viz.: One in the *Minto* under Mr. Frederick Anderson; a second under Mr. W. E. W. Jackson, operating from the steamer *Arctic*; and a third, in charge of Mr. H. D. Parizeau, was occupied in making a survey of Rupert bay, with a view to reporting on suitable localities for a harbour in connection with a railway terminus.

Surveying operations were carried on off Nelson Roads, by Mr. Anderson, from the C.G.S. *Minto*, with the result that a chart has been published showing the 'Approaches to Nelson river,' including the entrance to the river as far up as Flam-boro Head, and extending out beyond Nelson shoal; a chart of 'Anchorage in Hudson strait' (comprising Button islands, Port Burwell, Sugluk inlet and Erie cove) has also been issued.

With reference to the surveying in connection with likely locations for a harbour in connection with a railway terminus on James bay, carried out by Mr. Parizeau, several suitable localities were reported on, where a harbour could be developed without undue expenditure.

As a result of the Magnetic Survey of Hudson bay, carried out by Mr. Jackson in the *Arctic*, new lines of magnetic declination have been laid down for Hudson bay and strait, and much useful information obtained.

A small party, in charge of Mr. Charles McGreevy was engaged in connecting up the river St. Lawrence main triangulation with that of lake St. Louis, and also taking topography on both sides of the river in the neighbourhood of Lachine and Caughnawaga.

The service in connection with Automatic Gauges upon the Great Lakes and St. Lawrence river was transferred to this department from the Department of Public Works in May, 1912, and was in charge of Mr. F. R. Burgess. Much useful data and many valuable records have been obtained as a result of this work.

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A very complete record of all the expeditions to Hudson bay, as well as the work of the Automatic Gauges, is contained in the report of Mr. Stewart, Chief Hydrographer, which is appended at page 42.

During the season the following new charts were issued, viz.:—

- No. 98. Cove Island to Duck Island.
- 97. Duck Island to Detour Passage.
- 96. Cape Hurd to Gull Island.
- 305. Masset Inlet.
- 304. Arthur and Telegraph Passage.
- 54. Lake of Two Mountains (E. end).
- 55. Lake of Two Mountains (W. end).
- 401. Port Churchill.
- 404. Anchorages in Hudson Strait.
- 206. The Traverses.

St. Lawrence Pilots above and below Quebec, and a second edition of the following chart was issued, viz.:—

- No. 20. St. Nicolas to Quebec Bridge.

5.—RADIOTELEGRAPHY.

The number of Radiotelegraph Stations in the Dominion and on board Canadian ships has been increased by forty, as follows:—

Coast stations.. . . .	5
Licensed commercial stations.. . . .	2
Licensed experimental and amateur stations.. . . .	17
Government ship stations.. . . .	4
Licensed ship stations.. . . .	12

The total number of stations owned by the Government is as follows:—

On West Coast.. . . .	10
On East Coast.. . . .	18
On Great Lakes.. . . .	5

The range of these stations varies from 100 to 500 miles.

In addition to these, the Marconi Company owns and operates stations at Glace Bay (range 3,000 miles), Camperdown (250 miles), Sable Island (300 miles), Pictou (100 miles) and North Sydney (100 miles).

The total number of stations now in operation in the Dominion is as follows:—

East Coast.. . . .	22
West Coast.. . . .	10
Great Lakes.. . . .	5
Government ship stations.. . . .	16
Licensed commercial stations.. . . .	4
Licensed private stations.. . . .	2
Licensed amateur and experimental stations.. . . .	28
Licensed ship stations.. . . .	36

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The messages handled by the Coast Stations show a very satisfactory increase over last year's, as shown in the following table:—

	1911-12.		1912-13.	
	Messages.	Words.	Messages.	Words.
East Coast	119,049	1,824,450	153,843	2,704,411
West Coast	76,158	997,900	115,494	1,518,926
Great Lakes	1,013	17,095	2,750	52,422

This increase in business is very gratifying, and speaks well for the work of the General Superintendent of the Radiotelegraph Service and his staff.

ON THE EAST COAST.

The installation of a second mast at the Father Point Station was completed, and the enlargement of the Quebec Station is being entered upon.

ON THE GREAT LAKES.

Stations at Sault Ste. Marie, Midland, Tobermory and Point Edward were completed and placed in operation, and the enlargement of the Port Arthur station is now in progress.

Sites have also been secured for stations at Port Burwell, Toronto and Kingston, and the erection of these stations is being proceeded with.

ON THE WEST COAST.

A new station has been completed and put in operation at Alert bay, for communication with ships for 100 miles of the inside passage between Queen Charlotte sound and Chatham point.

The stations at Pachena and Cape Lazo have been enlarged, a second mast has been installed at Dead Tree point, and repairs carried out to the station at Triangle island, and Estevan.

Plans and specifications for buildings, masts and apparatus for two stations to be installed, one at Port Nelson, Hudson bay, and one at Le Pas, Man., were prepared for the Department of Railways and Canals, and it is expected that these stations will be placed in operation about October, 1913.

Valuable assistance has been rendered by the Radiotelegraph Service in many cases of disaster to shipping, etc., which has resulted in the saving both of human lives and of the vessels themselves.

RADIOTELEGRAPH CONFERENCE.

The second Radiotelegraph Conference was held in London on 4th June, 1912, having been postponed from the previous year on account of the coronation of His Majesty.

The Dominion of Canada was represented by the undersigned and the General Superintendent of Wireless Telegraphs.

The undersigned received from His Majesty plenipotentiary powers authorizing him to negotiate and sign a Radiotelegraph Convention on behalf of the Dominion of Canada with the other nations represented at the conference.

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It is understood that this is the first time a treaty has ever been signed for Canada by her own representative as distinct from a treaty signed by Great Britain for Canada. At the Radiotelegraph Conference, Canada and the other Dominions took their places as independent units, discussed the questions raised and voted on the various proposals from their own standpoints, the Dominion representatives taking action quite independently of the members of the British delegation.

Many valuable conclusions were arrived at by the conference, the principal of which are as follows:—

(1) Compulsory communication between ship stations and shore stations, irrespective of the system employed.

(2) Ships equipped with radiotelegraph apparatus were required to possess a license from the Government whose flag she flies, and the classification of the ship must be indicated in the license, on which the number of operators to be borne is shown.

(3) The question of the wave lengths of shore stations was fixed at 300 and 600 metres, of which one must be notified as the normal wave length. Ship stations also were required to comply with these regulations, except that the normal wave length is fixed at 600 metres, unless physically impossible. The wave length of 160 metres was reserved for radiophares, while wave lengths between 600 and 1,600 were reserved for Naval and Military purposes.

(4) Rules were adopted governing long distance transmission.

(5) Two classes of operators were established in lieu of only one, as formerly authorized.

(6) The control of wireless telegraph stations on board ships was definitely stated to be in the Captain's hands.

(7) Arrangements were arrived at with a view to simplifying accounting methods, and improving the handling of business.

(8) Regulations were included to cover the handling of meteorological messages and time signals.

(9) Special permission was obtained for the Dominion Government to fix the total radio rate on outgoing business via each of its coast stations; the ship to be credited with two-fifths and the coast station with three-fifths of this radio rate, irrespective of what 'ship charge' may have been filed with the International Bureau for the ship, this reservation to apply to business originating at offices in North America only.

LEGISLATION.

On 6th December, Bill No. 26, entitled 'An Act respecting Radiotelegraphy,' was introduced into the House of Commons, and, after various amendments had been made, received its third reading in the Commons on 29th April. Having been passed by the Senate, it finally became law on 6th June, 1913.

This Act, in addition to providing for the issuance of licenses to all radiotelegraph stations of any description, also provides for:—

1. The compulsory equipment of wireless apparatus on three classes of passenger steamers—

Class (A).—Passenger steamers licensed to carry 50 or more persons and plying between ports more than 200 miles apart.

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Class (B).—Passenger steamers licensed to carry 250 or more persons and plying between ports more than 90 miles apart.

Class (C).—Passenger steamers licensed to carry 500 or more persons and plying between ports more than 20 miles apart.

Certain waters and routes are exempted from the above conditions.

2. The forwarding and delivery of radiotelegrams by Canadian land lines and cables.

3. The employment of only British subjects as operators on land stations.

4. A penalty for the transmission of a false distress call or for wilful interference.

5. Power will be given to the Governor in Council:—

I. To fix the fees to be paid for licenses.

II. To accede to any International Convention respecting wireless telegraphy, and to make regulations for the effective carrying out of the same.

III. To make regulations for the censorship of radiotelegrams.

6. Power is given to the Minister:—

I. To classify stations and to specify what equipment the stations in each classification must have.

II. To issue licenses for stations and to fix the period for which they shall be valid.

III. To prescribe the form of the licenses and the conditions and restrictions they shall contain.

IV. To examine persons for operators' certificates, to prescribe the form of the examinations for these certificates, and to prescribe what class of operator will be required to work at the different classes of stations.

V. To specify the watches to be kept at the different stations and the number of operators which shall comprise their staff.

VI. To make regulations for the inspection of all stations.

VII. To make regulations to govern the working of installations on ships within the territorial waters.

VIII. To make regulations to govern the working of all stations in the Dominion with reference to intercommunication.

7. Power is given to His Majesty to assume possession of a station at any time, and to work the same in the public service.

Adequate penalties are prescribed for any violation of the different provisions of the new Act.

The passing of this Act is expected to have a very beneficial effect on Wireless Telegraphy generally.

The report of Mr. C. P. Edwards, General Superintendent of the Government Radiotelegraph Service, is appended at page 99.

I have much pleasure in expressing my satisfaction at the efficient manner in which the officers and clerks of the department have carried out their duties during the year.

I have the honour to be, sir,

Your obedient servant,

G. J. DESBARATS,

Deputy Minister of the Naval Service.

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STATEMENT OF REVENUE OF DEPARTMENT OF THE NAVAL SERVICE FOR FISCAL
YEAR ENDED MARCH 31, 1913.

Royal Naval College—		
College fees, 17 Cadets.....	\$ 1,700 00	
Less refund Dr. W. B. Moore.....	32 24	
		\$ 1,667 76
Wireless apparatus licenses.....		67 00
Casual revenue....		28,637 61
Miscellaneous revenue.....		2,196 49
Wireless revenue :—		
Victoria station.....	\$ 3,428 24	
Point Grey station.....	742 80	
Cape Lazo ".....	324 61	
Packena ".....	42 18	
Estevan ".....	905 82	
Triangle ".....	674 21	
Ikeda Head ".....	347 39	
Prince Rupert ".....	2,675 71	
Dead Tree Point station.....	772 80	
Alert Bay ".....	14 64	
Port Arthur ".....	14 58	
Magdalen Islands ".....	475 00	
Tobermory ".....	0 80	
Midland ".....	1 70	
		10,420 48
Total...	\$42,989 34	

OTTAWA, June 13, 1913.

DEPARTMENT OF THE NAVAL SERVICE

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FINANCIAL STATEMENT FOR FISCAL YEAR, 1912-13.

<i>Naval Service.</i>	\$	1,660,000 00
Appropriation.....	\$	1,085,660 04
Expenditures.....		
Expenditure less than appropriation.....	\$	574,339 96
<i>Fisheries Protection Service.</i>	\$	320,000 00
Appropriation.....	\$	276,459 70
Expenditure.....		
Expenditure less than appropriation.....	\$	43,540 30
<i>Hydrographic Survey.</i>	\$	340,000 00
Appropriation.....	\$	309,050 16
Expenditure.....		
Expenditure less than appropriation.....	\$	30,949 84
<i>Radiotelegraph Service.</i>	\$	300,500 00
Appropriation.....	\$	193,741 58
Expenditure.....		
Expenditure less than appropriation.....	\$	106,758 42
<i>Tidal Service.</i>	\$	45,000 00
Appropriation.....	\$	31,616 08
Expenditure.....		
Expenditure less than appropriation.....	\$	13,383 92
<i>New Fisheries Protection Steamers.</i>	\$	275,000 00
Appropriation.....	\$	60,588 54
Expenditure.....		
Expenditure less than appropriation.....	\$	214,411 46
<i>New Hydrographic Steamer.</i>	\$	200,000 00
Appropriation.....	\$	113,264 38
Expenditure.....		
Expenditure less than appropriation.....	\$	86,735 62
<i>Patrol of Northern Waters of Canada.</i>	\$	40,000 00
Appropriation.....	\$	15,668 97
Expenditure.....		
Expenditure less than appropriation.....	\$	24,331 03
<i>Civil Government.</i>	\$	94,550 00
Appropriation.....	\$	77,280 21
Expenditure.....		
Expenditure less than appropriation.....	\$	17,269 79
<i>Contingencies.</i>	\$	20,000 00
Appropriation.....	\$	13,406 82
Expenditure.....		
Expenditure less than appropriation.....	\$	6,593 18

SUMMARY:

Grand total appropriation.....	\$3,295,050 00
Grand total expenditure.....	2,176,736 48
Grand total expenditure less than appropriation.....	\$1,118,313 52

OTTAWA, June 12th, 1913.

REPORT OF THE NAVAL BRANCH.

OTTAWA, April 1, 1913.

The Deputy Minister,
Department of the Naval Service,
Ottawa.

SIR,—I have the honour to forward herewith the Annual Report of the Naval Branch of the Department of the Naval Service for the year ending March 31, 1913.

ROYAL NAVAL COLLEGE.

The nineteen Cadets who entered the College in January, 1911, completed their course of college training in December, 1912. In order to obtain an entirely independent opinion of the results of training, application was made to the Admiralty to set and mark the papers for the passing-out examination; this was duly sanctioned, and the results proved eminently satisfactory, all the Cadets having passed and, the average obtained being higher than usual, the Examiners expressed their opinion that the results of the examination were most creditable and showed careful training at the College.

Through the courtesy of the Admiralty, these Cadets are now undergoing their year's training afloat in H.M.S. *Berwick*, a cruiser attached to the Fourth Cruiser Squadron.

In November, 1912, an examination was held for the entry of Cadets, and ten qualified, of whom eight joined the College in January.

There are at present seventeen Cadets undergoing training at the College. The Cadets have shown themselves very amenable to discipline, and the improvement both physically and educationally is most marked; as this becomes more widely known in the Dominion, it is anticipated that there will be keen competition for entry into the College.

In deference to the desire of some of the principal educational establishments in Canada it has been decided to change the time at which the entry examination will be held, from November to May, this coinciding better with the school year; the next examination will be held in May, 1913, successful candidates entering the College about 1st August.

ENGINEER SUB-LIEUTENANTS AND MIDSHIPMEN.

The six Engineer Sub-Lieutenants who were under training in the British Fleet have all qualified for, and been promoted to, Engineer Lieutenants.

Of the six Midshipmen under training in H.M.S. *Dreadnought*, one has been invalided out of the service owing to defective eyesight; the remainder obtained first-class certificates in their examination in Seamanship for the rank of Lieutenant; they have been promoted to the rank of Acting Sub-Lieutenant and are now studying at the Royal Naval College, Greenwich, England, with a view to completing the remainder of their examinations for promotion to the rank of Lieutenant.

The reports from Great Britain of the young Officers and men undergoing courses of training continue to be most satisfactory.

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RECRUITING.

No recruits have been entered since 1st October, pending a decision being arrived at as to the future Naval policy.

H.M.C.S. *NIOBE*.

The repairs to the *Niobe* were completed in December, and trials were carried out which proved satisfactory; the ship is now in an efficient sea-going condition, but is not able to undertake cruises owing to the deficient complement, the Active Service ratings having been sent back to England without being replaced.

The training of recruits has been carried out as far as circumstances will allow, and a party of fourteen Seamen has been sent to England to qualify for Seamen Gunner and in higher Gunnery ratings.

H.M.C.S. *RAINBOW*.

The *Rainbow* made various cruises on the coast of Vancouver island until August, 1912, when the Active Service ratings borne were sent to England and were not replaced, since when the ship has remained at Esquimalt, with occasional cruises to keep engines in an efficient condition.

H.M.C.S. *EARL GREY*.

The C.G.S. *Earl Grey* was transferred to the Department of the Naval Service temporarily in July, 1912, and was commissioned as H.M.C.S. *Earl Grey* by Officers and men of the Royal Canadian Navy to convey His Royal Highness the Governor General on a cruise round the gulf of St. Lawrence and the Maritime Provinces. On completion of the cruise the vessel was re-transferred to the Department of Marine and Fisheries.

HEALTH OF THE ROYAL CANADIAN NAVY.

A separate report by the Principal Medical Officer, H.M.C.S. *Niobe*, showing the health of the Royal Canadian Navy for the year 1912-13 is attached.

I have the honour to be, sir,

Your obedient servant,

C. E. KINGSMILL,

Rear Admiral, Director of the Naval Service.

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REPORT ON THE HEALTH OF THE ROYAL CANADIAN NAVY 1912.

The Commanding Officer,
H.M.C.S. *Niobe*,
Halifax, N.S.

The sick returns of His Majesty's Canadian Navy show a total number of 435 sick from all causes who were treated on the 'Sick List' during 1912, with a total of 3,461 days sickness.

Of these, 351 were returned from the Sick Bay fit for duty; 97 were sent to hospitals ashore, and 14 were invalided out of the Service. Two deaths occurred in the Military Hospital, Halifax, N.S.

Of these totals, H.M.C.S. *Niobe* supplied 266 sick, with 2,343 days' sickness; H.M.C.S. *Rainbow* had 90 sick, with 686 days' sickness; the Royal Naval College of Canada, Halifax, had 76 patients under treatment for a total of 420 days' sickness; the remaining 3 patients who account for 12 days' sickness were amongst the officials of H.M.C. Dockyard at Halifax, N.S.

These figures give rise to the following comparison between the ships on the Eastern and Western Stations, not taking into account the cases undergoing treatment in hospitals ashore:—

	'Niobe.'	'Rainbow.'
Average number of days each sick man was under treatment	8·8	7·8
The percentage of sick for the complement borne in each ship	62·73	12·85

NOTE.—This again shows that the conditions of service on the Pacific Station are markedly more healthy than at Halifax. In 1911, the comparison was two to one in favour of Esquimalt whilst this year it is as great as five to one.

Respective percentages of the more prevalent illness to the total number of reported sick:—

	'Niobe' per cent.	'Rainbow.' per cent.
Diseases due to exposure to cold and climatic changes, viz: influenza, tonsillitis, acute chest diseases, etc.....	27·06	21·1
Injuries.....	17·3	38·8
Venereal diseases (primary)	10·1	·0
Infectious fevers (measles, mumps, etc.) .. .	7·5	·0
Rheumatism.....	6·4	6·6

These figures show a decided improvement in the general health of the men on board these two ships, compared to 1911. The percentage of sick for the complement of men during 1912 shows the following decrease:—

<i>Niobe</i>	40·06 per cent less than in 1911
<i>Rainbow</i>	45·26 " " 1911

H.M.C.S. *Rainbow*'s return of diseases due to exposure to cold and climatic changes shows an increase of 5·7 per cent over last year, whilst her percentage of cases due to injury and rheumatism is practically the same as in 1911.

In H.M.C.S. *Niobe*, the percentage of diseases due to colds, etc., is 7 per cent less during 1912 than 1911, whilst that due to injuries and venereal diseases shows an increase of 4 per cent and 2 per cent respectively. The increase in the number of

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cases of injury is due to the fact that a large number of the ship's company was employed in repairing the ship whilst in dry dock, so that minor injuries were more liable to happen. The increase of 2 per cent in the venereal returns is probably due to the fact that the ship did not go to sea all this year and the men had easy access to the city, where temptation is constantly experienced.

During February to April there were various infectious diseases breaking out amongst the boys and younger ratings of the *Niobe*; great care was taken to isolate and disinfect all possible causes of infection on board, and anything approaching an outbreak was avoided.

From 28th February to 22nd March, ten cases of measles occurred; these were scattered over six separate messes about the ship and the infection in each of these messes was traced to houses ashore, measles being prevalent in Halifax during this period.

One case of mumps was reported on board; the infection occurred ashore and no further case broke out in the ship. An ordinary seaman, aged 18 years, developed a severe form of smallpox on board during March; his case was complicated by a specific infection and, though he was dangerously ill for ten days in the smallpox hospital at Halifax, he recovered and returned to duty, but was badly pitted and scarred all over.

As soon as the disease was recognized, the patient was removed to the smallpox hospital and a thorough disinfection of every possible source of contagion on board was carried out, the superheated steam disinfector in H.M.C. Dockyard being used. No further case occurred on board or in the city of Halifax and the original source of infection was hard to prove, but may have been due to the fact that the patient had received a letter from an infected village outside Quebec some days previous to the development of his rash.

One case of enteric fever is reported; this was the case of a Chief Petty Officer, (who was employed at Ottawa and borne on the books of H.M.C.S. *Niobe*.)

He visited Halifax in July on duty and developed typhoid symptoms on the train journey. He contracted his disease during the epidemic at Ottawa, was seriously ill in the Military Hospital at Halifax, but finally made a good recovery.

H.M.C.S. *Rainbow* had no cases of infectious fevers during the year.

The reason that so large a number as sixty-seven cases were sent to hospitals ashore in Halifax for treatment during the year is accounted for as follows:—

Thirteen of these cases were infectious fevers; and the fact that the arrangements for treating cot cases in the Sick Bay whilst the ship was in dry dock was not very satisfactory, made it a necessity to transfer many patients to the shore establishments who would otherwise have been treated on board.

Fourteen men and boys were invalided during the year, eleven from the Eastern Dépôt and three from the Western Dépôt, viz.:—

Invalided direct from H.M.C.S. Niobe :—

Harry Funnell, aged 16 years, a Boy invalided for flat-foot, 12th February, 1912.

William Lane, aged 30 years, an A.B., for chronic sciatica, 12th February, 1912.

Edmund J. Buxstead, aged 36 years, an A.B., for an injury to the right hand, 12th February, 1912.

Frank Hall, aged 16 years, Boy Artificer, for an injury to the right hand, 20th April, 1912.

James Macrae, aged 23 years, E.R.A., for organic heart disease, 15th May, 1912.

Charles Lewis, Officers' Cook, in R.N. College, chronic gastritis, 15th May, 1912.

William Carr, aged 20 years, Stoker, for epilepsy, 2nd October, 1912.

Invalided from the Military Hospital at Halifax, N.S.:—

George Davis, aged 35 years, Leading Seaman, for phthisis, 12th February, 1912.

David Sanderecock, aged 44 years, Sailmaker, for phthisis, 15th May, 1912.

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Lawrence Day, aged 21 years, Stoker, for enlarged testis, 13th June, 1912.

Samuel C. Hallett, aged 37 years, A.B., for chronic iritis in left eye, 22nd July, 1912.

Invalided from H.M.C.S. Rainbow :—

George King, aged 37 years, Stoker, for defective vision, 18th March, 1912.

George Miller, aged 16 years, Boy, for epilepsy, 18th March, 1912.

Invalided from the Military Hospital at Esquimalt:—

Edward Hollett, aged 24 years, Shipwright, for paraplegia, 16th August, 1912.

Mr. John A. Barron, Midshipman, R.C.N., serving in H.M.S. *Dreadnought* of the Imperial Navy, was invalided for defective vision in November. His eyesight had been troubling him for some months, and eventually he was transferred from the Home Fleet to *Niobe* for final medical survey.

Two cases of death are reported, both from the Eastern Dépôt. One in the person of James Cruickshanks, a Chief Petty Officer serving as Boatswain in C.G.S. *Canada*, but borne on the books of H.M.C.S. *Niobe*. This man was taken to the Military Hospital from his home ashore in Halifax, and died on 7th April, from malignant endocarditis. Ernest Brown, an Able Seaman, aged 34 years, was knocked down by a train at the level crossing to the dry dock on 15th July, and died in hospital the same day from internal injuries received.

The dental treatment of recruits has been carried out at the Dental College, Halifax, on the same lines as previously arranged, and has proved very satisfactory for the forty-six boys who received attention during the year.

THE FISHERY PROTECTION SERVICE.

The crews of the Fishery Protection vessels have been under the medical charge of the *Niobe* during the periods they have remained at Halifax, N.S. The general health of the Officers and men has been good.

There was some trouble caused by small outbreaks of scarlet fever and diphtheria during the earlier months of the year whilst the men were in the barracks in H.M.C. Dockyard at Halifax, N.S., as the arrangements for isolation and disinfection were difficult to ensure. During the summer months, however, we have instituted various alterations in the ventilation and general arrangement of the Barracks buildings which, it is hoped, will prove beneficial in the future.

THE ROYAL NAVAL COLLEGE OF CANADA.

The general report of health of the Royal Naval College for the year is satisfactory.

The sick returns show a total number of 76 cases treated on the sick list, 56 being Cadets and 20 being amongst the College staff.

The total number of days' sickness which these cases account for is 420, and the average number of days each patient was under treatment is five.

The 56 cases of sickness amongst the Cadets are apportioned as follows:—

15 cases of injury.

14 cases of minor stomach troubles and biliousness.

10 cases of catarrh and colds in the head.

9 cases of tonsilitis and sore throat.

5 cases of German measles.

1 case of scarlet fever.

1 case of chicken-pox.

1 case of debility.

Of the cases of injury, all were quite minor strains and skin wounds received in the most part, during recreation hours.

One case of fracture of the nasal bones occurred during a game of baseball; severe hemorrhage complicated the earlier treatment, but the Cadet recovered well with less deformity of the nose than was at first expected would be the case.

Of the cases due to gastric troubles, the majority occurred after a holiday ashore, when the Cadets' diet could not be regulated by the College authorities.

The cases of colds in the head and sore throat occurred, as would be expected, during the months of February to April, when the spring is setting in, and cold and damp winds prevail, and again during November and December before the winter has set in.

The fact that the city of Halifax was visited by many forms of infectious fever during the spring of 1912, and and there were cases of diphtheria, measles, mumps and even of smallpox occurring in the Dockyard, made it an anxious time for the care of the Cadets. One case of scarlet fever occurred and was sent to the infectious hospital, Halifax; it was of a mild nature. The five cases of German measles were all slight and were treated in the College Sick Quarters, as also was the one case of chicken-pox which occurred in November.

The enlargement of the Cadets' sick quarters, procured by taking No. 5 house into the establishment, has proved very satisfactory, as now there is good arrangement for the isolation and treatment of infectious cases by the Naval Medical authorities. The matron lives in the building and personally supervises the care of the patients, and the Cadets need not be sent to hospitals ashore for treatment except in urgent cases.

It is of interest to record the following facts relating to the general physical development of the first term of Cadets who joined in January, 1911, during their two years at the R.N. College.

The figures quoted here show the average increase in the measurements of the nineteen Cadets now serving in H.M.S. *Berwick* in the Imperial Navy.

Age in January 1911.	HEIGHT IN INCHES.			WEIGHT IN LBS.			CHEST GIRTH (IN INCHES.)								
							EXPANDED.			DEFLATED.			RANGE OF EXPANSION.		
	Jan., 1911.	Jan., 1913.	Increase.	Jan., 1911.	Jan., 1913.	Increase.	Jan., 1911.	Jan., 1913.	Increase.	Jan., 1911.	Jan., 1913.	Increase.	Jan., 1911.	Jan., 1913.	Increase.
15½ years.	65½	68½	3	113	137½	24½	33	35¾	2¾	29½	31½	2½	3½	4½	1

These figures are very satisfactory, showing as they do, an increase of eight pounds weight to each of the three inches gained in height; and whilst the chest measurement increased 2¾ inches for girth on expansion this was not obtained at the expense of the resiliency of the chest walls or the elasticity of the lung tissue as is evident by the fact that the average range of expansion of each chest reached the very satisfactory measurement of 4½ inches in January, 1913.

These measurements show that the physique of the Cadets improved steadily in healthy proportion as the result of their Swedish Drill, open air sports and diet at the R.N. College.

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It is interesting to note that during their holidays each Cadet lost in weight, on the average, two pounds.

I have the honour to be, sir,

Your obedient servant,

K. DIGBY BELL,
Staff Surgeon, R.N., Senior Medical Officer, R.C.N.

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FISHERY PROTECTION SERVICE.

OTTAWA, April 15, 1913.

The Deputy Minister,
Department of Naval Service,
Ottawa.

SIR,—I have the honour to report with reference to the Fisheries Protection Service last season as to the number of vessels and men engaged, and as to where each vessel was employed, with the names of the Commanding Officers, and a brief description of each vessel.

I also append extracts from the annual reports of the various Commanding Officers, giving details of the work carried out during the season 1912-13.

Nine vessels comprised the Fisheries Protection Service for last season, under the direct supervision of the Department of the Naval Service.

NAMES OF VESSELS AND THEIR COMMANDING OFFICERS.

Canada.—Lieutenant C. J. Stuart, R.N.R.

Curlew.—W. J. Milne.

Constance.—Thomas J. Kyffin.

Petrel.—Clement Barkhouse.

Vigilant.—P. C. Robinson.

William Jolliffe.—Holmes Newcombe (Fishery Officer).

Restless.—Charles Moore.

Falcon.—Alfred Copp.

Newington.—P. J. Ledwell (Fishery Officer).

The *Canada*, *Constance* and *Petrel* have been exercised at mine-sweeping and general duties regarding Examination Service, as laid down in the Scheme of Defence for Halifax harbour.

During the winter season, instruction has been given in 'First Aid,' in navigation and in signals to all Fishery Protection ships on Atlantic Coast.

The Instructor of Signals has also visited the *Vigilant* on lake Erie, and given a course of instruction.

No instruction has been given to officers and men of Fishery Protection Service on the Pacific Coast, as work is done there by chartered vessels. When the vessels now under construction are commissioned, a course of instruction will be given their crews.

'CANADA.'

Stations and Duties.—Patrolling the east and west coasts of Nova Scotia, watching for foreign fishermen inside the three-mile limit, and for any illegal fishing by Canadian fishermen during the close season, etc.

Canada is a twin-screw small third-class ship; length, 200 feet; beam, 25 feet; draught, 10 feet 6 inches; gross tonnage, 580 tons, and speed 17 knots. She is armed with two 12-pdr. 12-cwt. Q.F. guns aft, and two 3-pdr. Q.F. forward. She is electrically lighted throughout, carries a powerful search-light, and a crew of fifty-eight officers and men all told. She was built by Vickers Sons & Maxim, Ltd., England, in 1904, and is under the command of Lieut. Charles J. Stuart, R.N.R.

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The ship, having had a top-gallant forecastle built in to accommodate men for Gunnery Training classes, was hauled upon the marine slip at Dartmouth on 3rd July for overhauling and repairs. This work being completed on 15th July, ship returned to Dockyard to have four new guns mounted, two 12-pdrs. aft and two 3-pdrs. forward, on the new top-gallant forecastle.

This having been completed, *Canada* was commissioned on 17th July, and next day carried out Gunnery trials with Lieutenant (G) and party from *Niobe* on board. Stability tests, under the supervision of Mr. C. E. Duguid, of the Department of Marine and Fisheries, were then successfully carried out, and ship proceeded to her station.

On 8th August, in charge of Lieut. R. M. Stephens, R.C.N., *Canada*, in company with *Curlew*, proceeded to the entrance of the harbour to exercise 'Examination Service' duties with the 'Military Examination Battery,' returning to Halifax that evening.

On 13th August, proceeded in a dense fog to outer automatic buoy to assist *Earl Grey* in finding buoy; then took station astern and accompanied *Earl Grey* to Halifax, this ship having H.R.H. the Governor General, on board.

On 25th August, ship proceeded to sea with Gunnery Training Class, returning on 31st August.

On 3rd September, *Canada* left Halifax to cruise to the westward, calling at Lunenburg, Liverpool, Shelburne and Mahone bay, returning on 10th September.

On 11th September, acting on information received, the premises of Wilsons and Boutilliers, fish merchants, were searched for lobsters, and, the First and Second Officers having been sent away in boats, several traps were destroyed in the vicinity of Point Pleasant.

On 17th September, ship proceeded to Ironbound island, with Gunnery Training Class, returning on 19th September. During this practice, boats were sent away and many traps were destroyed in the neighbourhood of Tancook island.

On 20th September, a boat with several freshly-baited lobster traps was seized in the Northwest Arm.

On 23rd September, ship left for Chester with Gunnery Training Class on board.

On 8th October, Rear Admiral C. E. Kingsmill, the Director of the Naval Service embarked, and ship proceeded on a cruise, calling at Antigonish, Pictou, Summerside, West Point and Newcastle, for the purpose of investigating complaints as to illegal fishing. Admiral Kingsmill disembarking at Newcastle on 12th October, ship returned to Halifax, calling at Georgetown and Canso en route, and arriving there on 17th October.

After coaling, ship again took out Gunnery Training Classes.

On 22nd October, *Canada* left Chester with Shell Fish Commission on board, visiting Liverpool and Shelburne, then returning to Chester to continue Gunnery practice, returning to Halifax on 30th October.

After this, *Canada* continued her Fisheries Patrol work as requisite, until 1st December, when, on orders from Headquarters, ship proceeded to search for the missing steamer *Morien*, but without success, experiencing very heavy weather all the time, and reaching Halifax again on 11th December, 1912.

On 20th December, ship went into winter quarters, the ship's company being transferred to the Barracks in the Dockyard.

'CURLEW.'

Is a twin-screw iron steamer; length, 116 feet; beam, 19 feet 8 inches; draught, 11 feet 3 inches; gross tonnage, 158 tons; and speed, 10 knots. Her complement is twenty officers and men all told, and she is commanded by Captain W. J. Milne.

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The necessary repairs having been carried out during the winter at H.M.C. Dockyard, Halifax, ship was commissioned in April, and on the 30th left for her station on the Bay of Fundy, arriving at Digby on 5th May, where the Director of the Naval Service inspected the ship. Continued patrolling the southwest coast of Nova Scotia until 9th June, watching the Canadian lobster fishermen and the United States fishing schooners.

On 9th June, cruised along shores of Digby and Yarmouth counties, returning to St. Andrews on the 14th to clean and paint ship's bottom, cruising thence to Seal islands.

On 11th July, *Curlew*, assisted at the motorboat races at Courtney bay, returning via Grand Manan to Seal islands, cruising in that vicinity until 5th August, when ship returned to Halifax in order to exercise examination service, returning to station on completion of these exercises.

On 17th August, assisted at the regatta and celebrations in honour of H.R.H. the Governor General, which were being held at Digby, cruising from thence to Seal islands.

At Welshpool, on 4th September, the members of the Shellfish Commission embarked and visited the various fishing stations in Charlotte and St. John counties, disembarking on 11th September, at St. John. Having scraped and painted ship's bottom at Digby on the 13th September, *Curlew* cruised along the Digby and Yarmouth coasts, destroying several lobster traps.

Acting on reports received, frequent visits were paid to St. Mary and Passamaquoddy bays, and Grand Manan, several lobster traps being destroyed. On the 11th October, called at Quaco Ledge, isle of Haute, and Mina's basin, but finding nothing illegal, proceeded to Seal islands.

On the 20th October, the United States fishing schooner *Harvester* having gone on shore at Yarmouth cape, *Curlew* offered assistance, but the ship was too badly damaged to be removed.

Carried on cruising, and on 29th October proceeded to Passamaquoddy bay, to search for boats driving and illegally seining herring.

On 10th November the Shell Fish Commission came on board at St. John, and proceeded to Annapolis and Kingsport, leaving the ship again at St. Johns, *Curlew* continuing to patrol the southwest coast of Nova Scotia.

On 20th December, having arrived at Halifax, ship was paid off and placed in winter quarters, and the necessary repairs, etc., taken in hand.

During the season, the fishery laws were well observed, and little illegal fishing was met with, and, owing to the pollock and herring not schooling last season, no dynamiting was carried on.

'CONSTANCE.'

Is a twin-screw iron steamer; length, 116 feet; beam, 19 feet 8 inches; draught, 11 feet 2 inches; and gross tonnage, 185 tons. Her complement is twenty-three officers and men all told, and she is commanded by Captain Thomas Kyffin.

Ship was commissioned on 2nd April, the necessary repairs, etc., having been carried out during the winter. On 1st May ship proceeded to George's island, and there swung for adjustment of compasses, returning to Halifax the same evening.

On 3rd May, the Director of the Naval Service, with the Commander in Charge, H.M.C. Dockyard, came on board and inspected ship, which had proceeded to Bedford basin, where various evolutions were carried out.

On 7th May, *Constance* left Halifax, cruising westward; arrived at Shelburne on the 11th, and returned to Halifax on the 15th. Left for the westward again on 19th May, calling at Lunenburg and Shelburne, and returning to Liverpool on the 23rd. On 25th May ship assisted C.G.S. *Petrel* to tow the stranded Norwegian SS.

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Rhum off the bar at the mouth of Liverpool harbour, and on the 28th again returned to Halifax.

On 5th June, *Constance* left Halifax in company with the American seining fleet and cruised towards the east, calling at North Sydney, where ship coaled, and arriving at Georgetown, P.E.I., on the 19th June, after which vessel took up her station in Northumberland straits.

On 31st July, 532 lobster traps were destroyed at Cold Spring Head, all the accessory gear being seized and turned over to the Agent, Marine and Fisheries Department, at Pictou, N.S.

On 8th September, left station for Halifax, on orders from Headquarters, arriving on the 12th. Having been fitted with the necessary equipment for mine-sweeping, *Constance*, in company with *Petrel*, carried out mine-sweeping operations until the 24th September, and then sailed again for her station, arriving at Georgetown on 3rd October.

Took Shell Fish Commission on board on the 15th at Port Hawkesbury, and proceeded to Canso, returning to Mulgrave on the 19th, where the Commission disembarked, after which ship proceeded to Georgetown, and carried on her work in Northumberland straits.

On 30th October, *Constance* arrived at North Sydney, and remained in the vicinity of that port until 11th November, when ship sailed for Pictou, calling at Arichat and Port Hawkesbury en route, and reaching Pictou on the 20th November, after which ship was engaged in watching beam trawlers until 1st December.

On 2nd December, whilst off Cape George, the schooner *Dictator* signalled for assistance, having lost her captain overboard, and *Constance* accordingly towed the vessel to Port Hawkesbury, leaving that port next day and arriving at Halifax on the 5th December.

The ship, having been placed in winter quarters, was paid off on 20th December, all officers being retained for the winter.

During the season, *Constance* steamed 6,000 miles.

' PETREL.'

Is a steel screw ship; length, 116 feet; beam, 22 feet; draught, 10 feet 3 inches: gross tonnage, 192 tons, and speed, 10 knots. Her complement is twenty-three officers and men all told, and she is commanded by Captain Clement Barkhouse.

The ship was commissioned at Liverpool on 1st April, and, after completing repairs, arrived at Halifax on 13th April for adjustment of compasses.

On 17th April, with Lieut. Street, R.N. of H.M.C.S. *Niobe* and Captain and crew of C.G.S. *Canada*, ship proceeded to Navy island for Life Saving drill.

Ship then commenced cruising on station, which had been extended to include the coast of Cape Breton island, and on 4th May, the Director of the Naval Service inspected the ship. On 8th May, Mr. Woods, Second Officer and Signal Instructor of C.G.S. *Canada*, came on board to give a short course in signals. Ship then cruised west, and, meeting the United States mackerel seining fleet at Sand Point on 20th May, followed them around. The fishing fleet continued to arrive quickly, and by 2nd June numbered 37.

On 25th May *Petrel* assisted *Constance* to float the Norwegian SS. *Rhum*, which was ashore at Liverpool, N.S., and then followed the seining fleet until they passed North Sydney, thence cruising west to watch for stragglers. The first fish were taken off Sambro, where a few small catches were made, but the fish then scattered, and very few were taken on the whole coast.

On 20th June, the last of the fleet having left, ship returned to Halifax, and on the 25th was hauled up on the marine slip at Dartmouth for scraping and painting

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On 4th July *Petrel* proceeded west, searching for illegal lobster fishing, seizing one boat in Purcell's cove, and afterwards destroying many traps and lobster cars.

On 15th July, the United States banker *Nettie A. Heckman* was seized at Sand Point and towed to Shelburne. Having been turned over to the Inspector of Fisheries there, she was released after paying a fine.

Ship then continued cruising, watching the American lobster well-smacks, one of which, the *Pride of the Port*, was driven on shore and wrecked at Seal island.

On 1st August, Mr. Hebb, Fishery Overseer for Lunenburg county, embarked, and proceeded to Blue Rocks to settle a trap dispute.

On 3rd August, having embarked Mr. Ward Fisher, Inspector of Fisheries at Shelburne, ship proceeded over his district, calling at Tusket, Yarmouth, St. Mary's bay, Briar island, Digby, Bear river, Annapolis, South Shore, Bay of Fundy, Kingsport and Gaspereau river, landing Mr. Fisher on the 12th August.

Ship then proceeded to her cruising station, calling at Spencer's island, St. John Beaver harbour, Campobello and Yarmouth, en route. On 12th September proceeded to Halifax where ship was fitted for submarine mine-sweeping. On 19th September, with Torpedo Lieutenants from *Niobe* on board, carried out mine-sweeping practice in Bedford basin, until the 25th, when cruising was resumed. Arrived at Shelburne on 2nd October, and Halifax on 4th, where Rear Admiral C. E. Kingsmill, Director of the Naval Service, with Commander Martin, R.N., embarked, and proceeded on a tour of inspection. On the 7th, ship was inspected by the Director of the Naval Service, and then proceeded to Chester to embark Mr. Evans, Fishery Overseer, conveying him to Birch cove, Mill cove and Hubbard's cove to settle trap net disputes, landing Mr. Evans again at Chester.

On 11th October, the first of the fall seining fleet was met with off Liverpool, N.S., and ship followed the fleet as far as White Head. The Shell Fish Commission having embarked at Chester, ship proceeded to Liverpool, Lockport, Clark's harbour and Yarmouth, where the Commissioners disembarked, after which cruising was resumed. Having, with Mr. Evans, Fishery Overseer, settled a trap net dispute at West cove, St. Margaret's bay, *Petrel* again embarked the Shell Fish Commission at Halifax on the 9th November. Having visited Liscomb, Shelburne and Lockport, the Commission left the ship on the 13th, and cruising was continued.

On the 30th November, the last of the fall seiners left for home, after a poor season, and on 18th December, ship arrived at Shelburne, and was paid off on the 20th.

During the season very little illegal fishing was met with. During the open season the lobster catch was fairly successful, being slightly above the average. The spring catch of mackerel for the American seining fleet was a complete failure, the total catch only being 2,000 barrels, salt and fresh. In the fall, the catch was good on the Cape Breton coast, but a complete failure on the Nova Scotia coast.

During the season, *Petrel* steamed 6,831 miles, boarded 185 American fishing vessels, and destroyed 200 lobster traps and three lobster cars.

‘VIGILANT.’

Is a steel twin-screw ship; length, 175 feet; beam, 22 feet; draught, 10 feet; and gross tonnage, 396 tons. She is electrically lighted throughout and fitted with a powerful searchlight. Her complement is thirty officers and men all told, and she is commanded by Captain P. C. Robinson.

The ship having been given a thorough overhaul during the winter at Port Dover, Ont., was commissioned on 17th April, and proceeded on the 20th to the western end of the lake. Next morning, 107 nets were taken and landed at Kingsville, and on the 25th, 200 more were captured and also landed at Kingsville, which, with the previous lot, were sold.

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Ship then continued cruising without incident until 3rd May, when 126 nets were taken off Port Burwell, which were also sold. On 14th May, assistance was successfully rendered to the United States freight boat *Sultana*, which was ashore on Long point.

Cruising was carried on as requisite until 11th June, when Rear Admiral Kingsmill, Director of the Naval Service, embarked at Port Colborne, and, having inspected the ship, left again the same day. On 21st June, the Port Stanley fishing tugs *Wilma* and *Charlie Jones* were reported for fishing in West Elgin, contrary to the terms of their license, and on the 24th, ship visited the Life Saving Station at Point Pelee.

On 1st July, ship visited Port Dover for the Dominion Day celebrations, and on the 8th, Mr. Woods, Second Officer and Signal Instructor of C.G.S. *Canada*, embarked for a course of instruction in signals, remaining ten days. On 12th July, ship proceeded to Kingsville, and worked on boundary for the remainder of the month, seeing no signs of poaching. Ship then proceeded to visit Long Point Life Saving Station on the 2nd August, and carried on cruising until the 20th, when a second visit was paid to Point Pelee Life Saving Station.

On 2nd September, Commander Thompson, R.N., Officer in Command of the Marine Service, embarked at Port Colborne, and proceeded to Long Point Life Saving Station, calling at Port Stanley, en route. Having landed Commander Thompson on the 5th at Point Pelee, ship proceeded towards Collingwood, to be docked. Whilst off Sandwich, two men floating on a capsized boat were picked up and landed on an adjacent lighthouse. Arrived at Collingwood on 7th September, and immediately went into dry dock, where bottom was thoroughly cleaned and painted, and necessary work done to stern bearings. Having undocked on the 14th, ship arrived at Parry Sound on the 16th, proceeded thence to Midland, where the Director of the Naval Service embarked, and, arriving at Victoria harbour the same evening, landed the Director of the Naval Service, returning to Midland to coal, and proceeding thence to lake Erie, arriving at Kingsville on the 18th.

Work on the boundary was carried on, and no poachers were seen during the remainder of the month. On the 4th October, ninety nets were seized off Long point and sold at Port Dover, and for the rest of the month cruising was carried on, interrupted by the usual fall gales. On 2nd November, Point Pelee Life Saving Station was visited, and on 30th November an American fisherman was found in Canadian waters. The local officer having verified his statement that he had permission to fish, he was released, after being reported to both the local and Federal Governments.

On the 18th December, ship was visited by the Director of the Naval Service, and on the 20th was laid up at Port Dover for the winter.

During the spring and summer months very good weather was experienced, but after October, both fishing and cruising were interfered with by the rough weather. On the whole, very little poaching was carried on, and Canadian fishermen had a good season.

During the year, *Vigilant* steamed 7,262 miles, and seized 523 nets.

‘ WILLIAM JOLLIFFE. ’

Having been chartered as a Fisheries Protection vessel from the British Columbia Salvage Company, left Vancouver on the 1st April, Captain Holmes Newcomb as Fisheries Officer, and cruised on the west coast, visiting the various harbours, where several United States fishermen were ordered outside the three-mile limit. On the 9th April, proceeded to Queen Charlotte islands, cruising from thence to Dundas islands southward to Butler cove, arriving at Prince Rupert on the 12th, and Gordon harbour on the 15th, after which ship proceeded to Union bay, calling at Estevan islands, Goose islands, Virgin Rocks and Bull harbour. Leaving Union bay on the 20th, vessel cruised on the west coast of Vancouver island until the end of the month.

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when ship proceeded via Cox island and Lusiana bay to Prince Rupert, arriving on the 12th May.

Cruising northward, at Nass river two motor launches were seized for smuggling, and turned over to the Collector of Customs at Port Simson. Ship then continued cruising, and at Oval bay drove the United States steamers *Tapoia*, *Corona* and *Commonwealth* out of the port. On the 25th May, proceeded to the west coast, cruising there until the end of the month, and then returning to the north coast, destroying several nets, and driving out many United States fishermen on the way.

Continued cruising on the northern coast until the 18th June, then returning to the south for coal. Leaving Union on the 21st June, cruising was carried out on the west coast until the 13th July, and on the northern coast and Dixon's Entrance until the 27th, when ship returned south for coal, arriving at Ladysmith on the 29th with Messrs. Found, Commissioner of Fisheries, McIntyre and Cunningham on board.

Ship then cruised the west coast until the 19th August, when, Professor McMurdo having been embarked, vessel started north, cruising in that direction until the 30th August, visiting all the points of interest along the mainland and Queen Charlotte islands, dredging for specimens of the bottom. After coaling, cruised on the west coast until 14th September, and then on the north coast until 11th October, visiting many harbours in the Queen Charlotte islands. The west coast was then again visited and patrolled until the 19th, when ship returned to the northern waters, remaining there until the 4th November. Having coaled ship and washed boiler, ship left for the west coast again on the 17th November.

During a heavy southeasterly gale, a four-masted schooner was sighted in distress, with sails gone and mizzenmast overboard. This vessel was discovered to be the *E. K. Wood*, of San Francisco and, being waterlogged, the captain and crew wished to abandon her. After considerable difficulty the crew was saved, and the vessel taken in tow. However, in a heavy southwesterly squall, the towing hawser parted, and the vessel became a total wreck on West Barrier reef; the crew were afterwards landed.

Wm. Jolliffe continued cruising in northern waters until the 25th November, and western waters until the end of the month, thence returning to the north until 24th December.

Ship then returned to the south for Christmas, leaving Esquimalt again on the 5th January for the north, via the west coast. Around Queen Charlotte islands, Dixon's Entrance and Hecate strait, a large fleet of United States fishermen was operating, and ship was constantly ordering them outside the limit. On the 28th January, *Wm. Jolliffe* went south for coal, returning to the north again, until the 25th February. During this period, on the 19th February, information was received that a mine had blown up at Lockport, several men being severely injured. With the Provincial Constable and Dr. Code on board, *William Jolliffe* immediately proceeded to Lockport to embark the injured men, landing them in Prince Rupert next morning, and then returning to her regular duties.

Arrived at Esquimalt on the 26th February to wash out boilers, and, leaving on the 4th March, cruised on the west coast of Queen Charlotte islands until the 11th, returning then to Hecate straits and Dixon's Entrance, and arriving at Vancouver on the 22nd March.

During the season *William Jolliffe* steamed 29,191 miles.

'RESTLESS.'

Under Captain Charles Moore, was, during the month of April, 1912, engaged on patrol duty at the north end of Vancouver island, with headquarters at Port Hardy, B.C.

On 4th May, ship proceeded to Esquimalt, arriving on the 9th, after which ship underwent her annual overhaul and refit. This being completed on 13th June, ship

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left for New Westminster, calling at Victoria and Nanaimo, en route, and reporting to Mr. Cunningham, Chief Inspector of Fisheries, on arrival.

Carried out patrol duty in connection with the salmon fisheries until the 3rd July, visiting Bellingham and Anacortes, U.S.A.

On 4th July, *Restless* proceeded on an inspection tour of all the fishing stations on the coast, having embarked Mr. Found, Commissioner of Fisheries, Mr. Cunningham, Mr. McIntyre, Deputy Provincial Inspector, and Messrs. Taylor and Williams, at various ports. During this cruise the following stations were visited: Alberni, Uchucklesit, Sechart Whaling Station, Uculuit, Kennedy River, Clayoquot Sound, and ship returned to Victoria on 10th July. On 11th July, left to continue inspection of stations on the northern coasts, and, having coaled at Nanaimo, proceeded to visit Quuthiasca cove, Alert bay, Smith's inlet, Rivers inlet, Bella Coola, Kimsquit, Nama, Bella Bella, Buteglen, and Lowe inlet, arriving at Prince Rupert on the 21st, when the fisheries officials left the *Restless* to continue their work on the C.G. ships *Falcon* and *William Jolliffe*. Having coaled, ship left Prince Rupert on the 23rd May for Union bay, where the fisheries officials again embarked on the 28th May, proceeding thence to Vancouver and New Westminster, where, after a very satisfactory trip, the officials left the ship.

Ship then continued patrol duty until 5th August, when Messrs. Found and Cunningham proceeded to Blaine, U.S.A., on board *Restless*, ship then returning to Nanaimo. During the month of August vessel was engaged on the Fraser river, making also two trips to Bargain bay on Malaspina strait.

On 3rd September, with Mr. A. Robertson, of Harrison Lake Hatchery on board, *Restless* proceeded to head of Jervis inlet, returning on 5th, and then carrying out patrol duty until the season closed on 31st October. During the season, eleven boats were reported for violations of the regulations, their owners being fined for the offence.

On 31st October, ship left for Nanaimo whence, having embarked Inspector Taylor and Provincial Officer de Grey, she proceeded to the head of Seymour inlet, calling at various stations going and returning, and returning to New Westminster on the 13th November, having experienced very rough weather.

Arriving at Esquimalt on the 19th November, ship underwent repairs, etc., and on the 14th December, left for Port Hardy, via Nanaimo, relieving C.G.S. *Falcon*, on arrival. Continued this service until 8th February, when vessel proceeded to Prince Rupert, for patrol duty in the northern district, having been delayed a few days owing to stormy weather. On arrival, patrol work at the Dundas Islands station was carried out, on which duty ship was still engaged at the end of the fiscal year.

Since 1st November, ten American halibut vessels were boarded and forbidden the use of Canadian harbours, except for the purposes specified in the Fishery Regulations.

During the season, *Restless* steamed 7,950 miles, being under way 895 hours.

‘NEWINGTON.’

Was, on the 1st July, turned over to the Department of the Naval Service from the Department of Marine and Fisheries for employment on Fishery Protection duties, and Fishery Officer P. J. Ledwell was placed in charge.

Left Victoria on 5th July for the west coast of Vancouver island, and continued cruising in that vicinity until the 11th, when ship returned to Victoria, leaving again the following day for protection work on the west coast of the island.

On the 16th July, the United States fishing boat *Bonita* was captured while fishing inside the three-mile limit, and towed to Esquimalt where she was turned over to the Commander in Charge of the Dockyard; ship then returned to her duties on the west coast, arriving at Victoria again on 22nd July. Leaving Victoria on 23rd July, the

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United States fishing boat *Thelma* was seized while fishing inside the limit at Port Renfrew. *Newington* towed her to Esquimalt and then, on orders received, towed the *Thelma* and *Bonita* to Westminster, where they were both handed over to Inspector Cunningham; ship then returned to Victoria on 31st July. Ship left Victoria and continued on her duties on West Coast Protection Service work, returning to Victoria again on the 8th August, and leaving the following day. Cruising was carried out on the west coast without further incident until the 14th September, when *Newington* took fifty cases of gasoline from S.S. *Lugo* for Triangle island Wireless Station, and having landed gasoline returned to her Fishery Protection work, in which she was employed continually until 26th October, when the United States launch *Washington* was found at Bull harbour repairing engines. Continued cruising until 1st November, when *Newington* arrived at Victoria to undergo repairs; these having been completed, ship left Victoria on the 30th November, and took up her protection duties again until the 23rd December, when ship arrived at Victoria to undergo repairs which lasted until 2nd January, after which ship left for the west coast on 13th January.

After leaving winter harbour, the United States launch *Active* was seized, and was towed, via Esquimalt and Victoria, to Westminster, where she was turned over to Inspector Cunningham.

Cruising was then carried on without further incident until 15th February, when ship returned to Victoria for repairs, which were completed by 10th March, and Fishery Protection work was then taken up again and carried on without interruption until the end of the fiscal year.

From the 1st July until the 31st March, *Newington* was at sea 1,358 hours, and steamed 11,767 miles.

'FALCON.'

Captain Alfred Copp was employed under the orders of Captain Holmes Newcomb, of the *William Jolliffe*.

Having left Esquimalt on 18th November, ship arrived at Bull harbour on the 26th, having coaled at Nanaimo, en route. Owing to heavy weather, *Falcon* was unable to round Cape Scott, but had to return to Bull harbour. On 21st December, C.G.S. *Restless* arrived at Bull harbour, and *Falcon* left on the 30th for Prince Rupert, arriving on the 5th January, 1913, and leaving again on the 9th January, for duty in Hecate straits. At Stanley harbour, three American gasoline launches were discovered, but were allowed to shelter there until the gale moderated. On the 30th January, the fishing schooners went to sea. On 11th February, three American fishing schooners were permitted to shelter in Canadian ports. On the 12th, all the fishing schooners were ordered to sea. The Canadian fishing schooner *Princess Victoria* caught fire, and resulted in a total wreck. *Falcon* took the crew of this vessel on board, and proceeded to Prince Rupert, landing them there.

Having blown down boiler and coaled ship, *Falcon* left Prince Rupert on the 19th, anchoring at White Rocks Banks island that evening. On the 26th February, the American fishing schooner *Puritan* was permitted to anchor in Stanley harbour, to effect necessary repairs, being ordered to sea again on the 5th; on the same day, the United States schooner *Northland* put in to Port Stanley for water, being ordered to sea next day.

On 9th March, owing to a southeast gale with snow, the United States steamers *Welding* and *Orient* put in for shelter, proceeding to sea again on the 10th.

On the 15th March, *Falcon* arrived at Prince Rupert for coal and other supplies.

I have the honour to be, sir,

Your obedient servant,

C. E. KINGSMILL,

Rear Admiral, Director of the Naval Service.

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REPORT ON THE SURVEY OF TIDES AND CURRENTS

Ottawa, April 1, 1913.

The Deputy Minister,
Department of the Naval Service,
Ottawa.

SIR,—I have the honour to submit the following report regarding the Survey of Tides and Currents during the twelve months ending March 31, 1913.

It may be stated in general terms that the principal stations in Eastern Canada and on the Pacific coast have been maintained; further investigation has been made of the currents during the summer months, and a considerable amount of additional information on the tides has been obtained. This information has been published as a special report, or has been embodied in the Tide Tables. The surveying steamer C.G.S. *Gulnare* was again utilized for the investigation of the currents in the Gaspé region. The most noteworthy advance in the investigation of the currents is the large amount of reduction which has been carried out in bringing together all that is known on the Gaspé current, and in completing the results for Northumberland strait.

TIDAL OBSERVATIONS.

The principal tidal stations have been maintained in continuous operation throughout the year, without any interruption of note. There are six of these stations in Eastern Canada and five on the Pacific coast. Three of these are in the harbours of Victoria, Vancouver and Prince Rupert; and two of them are reference stations for larger regions, the system of reference stations being completed by Sand Heads in the strait of Georgia, at which six years of observation were obtained, while the lighthouse still existed off the mouth of the Fraser river.

During the year, considerable reduction of the tidal record from the principal stations has been made. This amounts, in all, to four years from the stations in Eastern Canada and five years from the stations on the Pacific coast. This record, for the purpose of harmonic analysis, must be absolutely complete, day and night, throughout the year; and if any interruption occurs, it must be made good by a special method which has been devised for the purpose. The record, when thus prepared and reduced, serves as a basis for the calculation of Tide Tables, and improves their accuracy from year to year.

FURTHER OBSERVATIONS OF THE CURRENTS.

In the season of 1911 an extended investigation was made of the currents in the entrance of the St. Lawrence. The region examined included the waters off the eastern end of Anticosti island and off its south shore, and also the Gaspé current on the southern side of the passage between Gaspé and Anticosti. When these observations came to be reduced, the variations in the Gaspé current proved to be so complex that additional observations were deemed advisable. Already, in the autumn of 1912, however, a Notice to Mariners was issued to explain the best routes to follow in order to take advantage of the current, or to avoid it, as the case might require.

To obtain a more satisfactory basis for the results desired, a further examination of the Gaspé current was accordingly made during the season of 1912, from July 22

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to October 19. The total length of the observations in the two seasons of 1911 and 1912 thus amounted to just one hundred days or twenty-four hours each. This afforded a satisfactory basis for a thorough investigation of the nature of this current, as the observations were continued day and night, and the speed was obtained every half hour by means of current meters registering electrically on board the vessel. Continuous observations of the force and direction of the wind were also obtained, to ascertain the influence of the wind upon the current. The observations were obtained by Mr. S. C. Hayden, with the assistance of Mr. W. A. Murphy for the night work. Captain C. T. Knowlton also gave valuable co-operation, in addition to his regular duties.

The Superintendent of the Survey, while in British Columbia, made full enquiries with regard to the passes which need further investigation on that coast. Observations at one of these were obtained last season. This was in Baker passage, just east of Victoria, off Cadboro point, which is used by all the steamers between Vancouver and Victoria. It was found that a resident lives at this point, with whom arrangements were made to take the observations. A result was worked out promptly from these, in time for publication in the Pacific Tide Tables for the coming year. This result will be of much service in the navigation of this passage. Complete arrangements were also made for further observations in Seymour narrows. The present time is most opportune for this; as in this year the moon attains its highest range of declination in the nineteen-year cycle, and the behaviour of the tides on the Pacific coast are dominated by the declination of the moon. The arrangements for the purpose included the erection of a temporary house for the observer with a camp outfit, as the shores of Seymour narrows are uninhabited, together with a chronometer for correct time and other accessories. The observer, who is a competent seaman, proceeded to the locality at the end of February to commence the observations as early in the spring as possible. A more extended basis for the calculation of slack water in Seymour narrows will thus be obtained, which will be invaluable for the large traffic which connects the northern and southern regions of British Columbia, as well as for the international traffic to Alaska.

RESULTS OF THE INVESTIGATION OF THE CURRENTS.

The Gaspé current.—This current is constant in the sense of flowing continually in one direction, which is outward from the estuary of the St. Lawrence towards the gulf; but it is subject to a marked fluctuation in velocity in accordance with the tide. The strength increases with the ebb and is decreased by the flood, which acts against it. This accord with the tide is so very definite that any change, such as diurnal inequality, is well marked also in the current. In addition to this fluctuation, there is a variation in the course of the month with the moon's distance, as well as the usual variation in strength from springs to neaps. Any disturbance from the wind has also to be distinguished from these variations of a periodic character. A thorough and exhaustive reduction of the observations was made, and special methods were devised to distinguish these variations and to estimate their amount separately. The final results are given concisely in a report on the currents in the entrance to the St. Lawrence, which has now been prepared.

From these results, a mariner can ascertain with reference to the Tide Tables, the time at which the greatest and least strength of the current occurs. He can thus know whether he is on the flood or the ebb at the time, and determine his course accordingly. The greatest and least strength of the current are also indicated in the Report, as well as its variation in strength from springs to neaps. The extreme or unusual velocities of the current are also stated. The effect of the wind upon the current, showing the slight influence which it has, is fully discussed. Practical directions are also given with regard to the best routes to follow to save time on the inward and outward courses.

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Northumberland Strait. The observations in this strait, which were obtained in the season of 1908, proved to be very difficult to reduce to any form which would be of value to the navigator. The variations proved to be so wide that no rules of practical value could be obtained by any method that could be devised. The reduction of the observations has thus been lying over for some time as an insoluble problem. There were also observations of the turn of the current which were taken by fishermen in the season of 1902 and 1903. They have excellent means of observing the turn, from the floats attached to their traps which they haul at slack water; and the observations which they took were carefully supervised.

The complex behaviour of the current in this strait is due to the nature of the tide. It is governed by the declination of the moon, which produces a large diurnal inequality. There are times when the tide at Charlottetown shows a difference in range between the two tides of the day which is nearly twice as great as the difference between springs and neaps. This change recurs in the period of the nodal month, which overruns the synodic month of the moon's phases; and it thus sometimes affects the spring tides and sometimes the neaps. The inequality is also reversed by the upper transits of the moon when in north declination and the lower transits when in south declination. On account of this series of complexities, the variation in the current is often attributed to the wind; whereas, in reality, these changes recur with astronomical regularity.

Subsequent observations obtained in 1910 on the north shore of the gulf of St. Lawrence, have thrown considerable light on the behaviour of the tide throughout the area of the gulf of St. Lawrence. The methods devised for the reduction of the Gaspé current have also served to indicate the best way to deal with similar complexities. By following these clues, a satisfactory solution has been obtained by which the movements of the current in Northumberland strait can be reduced to law.

It was found best to base the reduction upon the time of maximum velocity on the flood and ebb, in order to bring this into relation with the time of the tide. An exhaustive series of comparisons was then made with several of the principal stations; and it was thus discovered that the flood is related to low water at Father Point and the ebb to high water at St. Paul island. This alteration with the tide on the opposite sides of the gulf is in accord with the results obtained from the observations of 1910.

Now that this relationship is established, it is hereafter possible to know the time at which the greatest strength of the current occurs, by reference to the Tide Tables. The three narrows which occur on the length of Northumberland strait are also distinguished; and the information regarding them, which will be given in the Tide Tables, will enable the mariner to know whether flood or ebb is running at the time, which is the point of chief importance; and the approximate strength of the current at its maximum will also be known.

FURTHER TIDAL OBSERVATIONS AND TIDAL STATIONS.

In addition to the regular observations obtained throughout the year at the principal tidal stations, information at several new points in British Columbia was secured during last season. It was of special importance to obtain observations throughout Burrard inlet, on account of the proposed enlargement of the entrance of First Narrows, by dredging. This alteration may very well modify the behaviour of the tide in the inlet, and affect its range; and observations were therefore desirable before any alteration was made, to detect such change. With this object, tide gauges were placed at Port Moody, at the head of the inlet, and on the east shore of the North Arm at the wharf of the Vancouver Power Company. The observations thus obtained were simultaneous with the continuous record in Vancouver harbour.

The Public Works Department was carrying on surveys during the season in the neighbourhood of Vancouver, directed by Mr. O. Lefebvre, for which tidal data were

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required. The expense of obtaining these in Vancouver harbour was saved because of the tide gauge there; but special observations were required in False creek. The notes of these were kindly lent to this survey, from which sufficient tidal data were obtained to enable the time of the tide at the middle of False creek to be worked out. The inner end of the creek, above the middle, is shortly to be filled in for railway purposes. The result will enable the time of the tide on the open side of Vancouver, in English bay and False creek, to be given with accuracy in future Tide Tables.

Another hydrographic survey was being made in the mouth of the Pitt river at Coquitlam. By co-operation with Mr. F. P. Wilson, C.E., who is engaged to carry out this survey, a tide gauge record was obtained in the autumn and up to the end of January. This will be of service in determining the progress of the tide up the Fraser river, as simultaneous observations at New Westminster were carefully supervised by Mr. B. E. Spencer. These observations are the more valuable, as they are reduced at both places to the Public Works datum, which was extended to Coquitlam by Mr. Wilson by means of instrumental levelling.

New developments are proposed in the Saanich peninsula, north of Victoria, by the British Columbia Electric railway; which will probably make navigation in this region of greater importance. It was not practicable to place a tide gauge in the bay at the end of the peninsula which will form the terminus of the electric railway, as no wharf has yet been built there. Two tide gauges were accordingly erected at Sydney, and at Tod inlet in Saanich arm, on the two sides of the peninsula. The new terminus is included between these, and they are also of growing importance in themselves. The observations obtained will enable tidal data to be determined for this region.

Another tidal station was erected at the head of the Portland canal. This is at the northern extreme of British Columbia, and it thus serves to tie in with Port Simpson several intermediate places, such as Granby and Naas bay, on the adjoining inlets. The result has quite justified this expectation, as the difference in time with Port Simpson is very small. This has already been observed in the case of the deep inlets of the Pacific coast, in which the tide is nearly simultaneous at the mouth and at the head.

The erection of these five tide gauges was entrusted to Mr. H. W. Jones, who also inspected the principal tidal stations on the coast during the season. At two of these stations, a group of Australian piles was driven at the site of the gauge, as much trouble has been experienced from the *teredo*. Ordinary piling in the wharfs can only be depended upon for about three years; and when it gives way, the levels are thrown out, and the record itself may be interrupted, which renders it extremely difficult to make any use of the observations obtained. It is therefore hoped that the Australian timber will prove serviceable in resisting the *teredo*, as it is said to be.

Bench Marks.—At Vancouver it was found that the original bench-mark to which the datum of the harbour chart is referred, was about to be demolished. It was on the Canadian Pacific Railway station, which is to be rebuilt. The destruction of this bench-mark would involve the loss of a reference level for depths in the harbour, which are essential for dredging and wharf construction. The Superintendent therefore arranged with the Canadian Pacific Railway engineers to establish a new bench-mark on the north end of the custom-house building. For further security, in the meantime, a reference bench-mark was established on one of the lower steps of the Post Office. The new bench-mark on the custom-house has been established by Mr. Cambie, C.E., and this Survey has communicated to the British Admiralty its description and elevation, for chart purposes. At Prince Rupert the greatest difficulty has been experienced in maintaining a uniform datum for the tidal observations. The reference marks have been repeatedly destroyed or removed by excavation. Last season a permanent mark was set in the new concrete pier at the foot of McBride street, and its elevation was carefully determined with reference to previously estab-

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lished levels. This mark will be of permanent value to the city and harbour: especially as the Chart datum is definitely known in relation to the datum of this Survey.

HUDSON BAY AND STRAIT.

As this region has now been placed in charge of this Survey for tidal purposes, the trouble has been taken to collect together all the observations and other information of a tidal character which exist. This information includes the early observations of the Gordon expeditions of 1884 to 1886. In recent years, tidal observations have been obtained at Nelson and Churchill by the Hydrographic Survey and by the Department of Railways and Canals during surveys in charge of Mr. H. T. Hazen. Also, by co-operation with Mr. J. G. McMillan, who is carrying on surveys for the Temiskaming and Northern Ontario railway, observations have been obtained at Moose Factory in James bay and at two other points in the mouth of Moose river.

The greater part of the observations thus obtained are in the form of notes; and during the present winter these are being plotted as tide curves, so that the best method of dealing with them to secure practical results may be considered. As there is no reference station either in Hudson bay or in the strait with which the tide can be compared, it is necessary to ascertain whether any existing tidal stations can be utilized for this purpose. Already a considerable amount of trial work has been carried on with this object in view.

In Hudson strait the most extended observations were obtained at Ashe inlet, which is just in the middle of the strait at a most suitable point for a tidal station. The observations prove to be much broken, however, and the night tides are largely wanting, which makes it uncertain whether the observations can be reduced by harmonic analysis, as a basis for tide tables. On this account, further investigation will be carried out to see whether any existing reference station can be found with which it can be brought into relation.

For the general behaviour of the tide in the North Atlantic, it was inferred that the tide in the main area of Hudson bay would prove similar in character to the tide in the North sea. After a considerable amount of comparative work, it was found that this was the case. For comparison with Nelson, harbours in the North sea were selected with as nearly as possible the same range, and showing the same type of estuary tide. It was eventually found that Bremerhaven in the southeast angle of the North sea, best fulfilled the required conditions; and that the difference of time between the two places is nearly constant throughout the course of the month. Inquiry is now being made to obtain, if possible, simultaneous observations at Bremerhaven. If the tide at Nelson can thus be established, it may serve in turn as a port of comparison for other places in Hudson bay. Some of the observations already obtained are simultaneous with Nelson, and it may thus be possible to refer them to it. If these endeavours are successful, it will be an important step in obtaining satisfactory tidal data for Hudson bay.

CO-OPERATION WITH OTHER SURVEYS.

The amount of co-operation with other surveys which has been carried on during the year may be explained by saying that nine registering tide gauges have been supplied, together with complete outfits and instructions for taking over the tidal observations; and also in some cases with the means of obtaining time with accuracy, which is essential for the purposes of this Survey.

On the Pacific coast, the Hydrographic Survey was supplied with a tide gauge which was used at Paoi in the Queen Charlotte islands. Some valuable information was also obtained by means of gauges supplied in the previous season, from which tidal record has recently been received. This record is from Queen Charlotte in

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Skidegate Inlet, which is developing rapidly; and from Ocean Falls, a new manufacturing establishment in Cousins Inlet. Another gauge was supplied to the Hydro-electric Company, of Prince Rupert, from which record has now been obtained on the Hoosall river, a tributary of the Skeena. This will be of service in following the progress of the tide in these estuaries. In Eastern Canada, the Hydrographic Survey was supplied with a tide gauge which was erected at Bersimis on the lower St. Lawrence. The information thus obtained is valuable; as previously there was a long gap on the north shore of the St. Lawrence from Escommins to Point des Monts.

On the St. John river, three tide gauges with their outfits were supplied to Mr. J. K. Scammell, of the Public Works Department. His object was to ascertain the variation in the level of the river during the season, as well as the amount of tidal fluctuation. The gauges were placed at Rothesay, Carters Point and Hampstead; and one of them also for a short time at Marble Cove near Indian town. On account of the wet season, the level of the river water did not fall as usual; and these observations will be resumed next summer in the hope of obtaining better results. The other tide gauges supplied to Surveys in British Columbia and in James Bay have already been mentioned.

INFORMATION SUPPLIED.

As the work of this Survey is so widely known, a large number of requests are received for information of the most varied and miscellaneous character. Such requests are too numerous to give in detail, but they frequently involve special work, drawings, or calculations to meet the requirements. Requests for Tide Tables are received almost daily. The following may be mentioned as being of greater importance than usual:—

Concise notes on the behaviour of the currents at the entrance to the St. Lawrence were sent on request of the Hydrographer to the Admiralty, to be put on three of the charts of that region. These notes were based on recent investigations in the Anticosti region.

Accurate values for mean sea-level were supplied to the Dominion Observatory as a basis for the extended geodetic levels which are being carried out in Eastern Canada. These values of mean sea-level are based on eight to thirteen years of continuous tidal observations at Halifax, St. John, N.B., Father Point and Quebec. The data thus obtained by this Survey, afford a basis for our Canadian levels which is far in advance of any that have been obtained on the Atlantic coast of the United States.

Explanations regarding the tide at the principal harbours on the Pacific coast were supplied to the Marine Department, for insertion in the Port Directory of the Pacific coast, now in preparation.

The other information supplied is chiefly of the nature of tide levels, benchmarks, and the extreme rise of the tide, for construction purposes, docks, dredging, or works carried out by industrial companies. The results obtained by this Survey are thus of widespread service, in addition to their direct advantage to navigation.

PUBLICATIONS.

The publication of most importance during the year is the Report on the Currents in the Entrance to the St. Lawrence river. In this report the early investigations of 1895 and 1896 are included and also the observations during two seasons taken at the lightship off the east end of Anticosti, as well as the investigations carried out with the surveying steamer during the seasons of 1911 and 1912. The report thus gives a full and complete account of the currents in the entrance of the St. Lawrence, the waterway which is used by all the transatlantic trade which passes south of Newfoundland or through Belle Isle strait.

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The tidal information for Canada is now published in two sets of Tide Tables; one for the Eastern coasts and the other for the Pacific coast. This division facilitates their distribution. The editions of these tables are being increased in quantity, especially for the Pacific coast.

In addition to the complete tables, two abridged editions are issued of pocket size. One of these is for Quebec and the St. Lawrence, and the other for St. John, N.B., and the Bay of Fundy. The circulation of these abridged editions is also steadily increasing, and they are much appreciated.

The information in the Tide Tables for both coasts is added to, from year to year, by data for new localities, and from information regarding the currents. The basis from which the Tide Tables are calculated is also being extended for the improvement of their accuracy.

Some of the more important Tide Tables are republished in Eastern Canada or on the Pacific coast, much in the same way as described in last year's report. Information is also supplied for publications issued by the Marine Department or by the British Admiralty, as there indicated.

STAFF.

This Survey is carried on by the office and field staff, the officers and crew of the surveying vessel, and the outside tidal observers, who number six on the Eastern coast of Canada and five on the Pacific coast, at the permanent tidal stations. In addition to these, there are several others employed locally in the summer season for the observations of tides or currents; and there are engineers on other surveys who give their co-operation. The permanent staff overtakes the outside work in the summer season; and in the winter the reduction of the observations and calculation of Tide Tables, as well as the ordinary office work.

I have the honour to be, sir,

Your obedient servant,

W. BELL DAWSON,
Superintendent of Tidal Surveys.

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HYDROGRAPHIC SURVEY.

OTTAWA, July 2, 1913.

The Deputy Minister,
Department of the Naval Service,
Ottawa.

SIR.—I have the honour to submit the following report upon the progress of the Hydrographic Survey for the fiscal year ended March 31, 1913.

The following hydrographic surveys were carried on during the season of 1912:—

Branch.	Steamer.	Normal H. P.	Gross. Tonnage.	Surveying Officers.	Ships' Officers.	Petty Off- cers & Men
Lake Superior	'La Canadienne'	60	372	3	3	22
Ontario	'Bayfield'	112	276 (86)	3	3	21
Lower St. Lawrence.	'Cartier'	141	556 (224)	4	4	30
Pacific Coast.	'Lillooet'	94	575 (311)	4	4	33
Hudson Bay	'Minto'	450	1,090 (372)	5	7	43
(Magnetic).	'Arctic'		762 (518)	2	7	23
James Bay	'Sch. Chrissie Thomey'		136 (123)	3	2	15
St. Lawrence River.	'Gasoline Launch'	12	4 (3)			
Automatic Gauges						

LAKE SUPERIOR SURVEY.

This survey was in charge of Mr. Charles Savary, assisted by Messrs. R. J. Fraser and E. Jodoin, and Capt. Brown, as sailing master and pilot, and Mr. Joseph Cosford, as chief engineer.

The steamer *La Canadienne*, after undergoing considerable repairs, as she had been out of commission for some years, finally left Quebec on June 14.

While passing up through the Welland canal she met with a very unfortunate accident which caused over a week's delay, and it was not until the 28th that it was possible to leave the dry dock at Port Dalhousie and continue the voyage.

The first work taken in hand was at Great Duck island, lake Huron, connecting up the lighthouse with the United States Lake Survey station on that island.

Lake Superior was reached on the 7th of August, where Caribou island was traversed on a scale of 2,000 feet to one inch, and the new lighthouse on the east end of Michipicoten island was connected with the United States Lake Survey triangulation stations.

Owing to the thick weather prevailing, much time was lost and the observations were not completed until the 22nd, when the ship proceeded to the northeastern part of the lake to complete the chart 'Copper island to Lamb island.' Mr. Savary reports that in this district the party traversed 24 miles of coast line, sounded 286 miles from boats and 297 miles from the steamer.

On the 15th of October, the *La Canadienne* left lake Superior and proceeded to the north channel, lake Huron, to make a survey of Little Current. This work was completed about the middle of November, covering 137 miles of boat sounding and 25 miles of coast line.

On November 18th, the ship arrived at Owen Sound to be laid up for the winter, and the crew were paid off.

The staff returned to Ottawa and spent the winter plotting the season's work and preparing charts for the engraver.

As a result of the above work, the following charts and plans will be completed:—

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No. 103, Copper island to Lamb island (eastern portion) Little Current.

On the 19th of March Mr. Savary was transferred from this survey to the lower St. Lawrence, on the resignation of Commander Miles.

LAKE ONTARIO SURVEY.

This survey is in charge of Mr. A. G. Bachand, who was assisted by Messrs. E. Ghysens, J. U. Beauchemin, and M. Cailloux; also Capt. McQuade, as sailing master and pilot, and Mr. John Nisbet, as chief engineer.

Messrs. Beauchemin and Cailloux, after graduating from the Ecole Polytechnique, joined the survey on May 18th, and gave a good account of themselves.

The steamer *Bayfield* fitted out at the Dominion Lighthouse Depot, Prescott, and left on 8th May, for the surveying ground on lake Ontario. Operations were mainly carried on between Cobourg and Toronto. Port Whitby, the most central place, being chosen as headquarters. The water triangulation was continued from Port Darlington to Toronto, and shore partly traversed.

The ten-fathom line was clearly defined along the shore, and soundings carried out a distance of from fifteen to seventeen miles, but no shoals of any importance were discovered.

As a result of the season's work, a chart 'Presqu'île to Port Darlington' will be published; also large scale plans of Bond Head harbour, Port Darlington and Port Whitby.

On November 3rd, the *Bayfield* went into dry dock at Port Dalhousie, where her hull was scraped and painted. On November 9th, she returned to Prescott and was laid up for the winter and the crew paid off.

The staff returned to headquarters at Ottawa and have been employed during the winter plotting the summer's work and preparing fair sheets for the engraver.

LOWER ST. LAWRENCE RIVER SURVEY.

This survey was in charge of Commander I. B. Miles, R.N. (Retired). The season was started with Lieut. J. H. Knight, R.N. (Retired), and Mr. Alex. Pinet as assistants. Early in June, Messrs. L. B. Allan and E. R. Scandrett, recent college graduates, joined the staff. About the middle of July, Lieut. Knight left to join the Hudson Bay survey. Capt. H. J. McGough acted as sailing master, and Mr. D. Marotte as chief engineer.

The steamer *Cartier* fitted out at the Quebec agency of the Department of Marine and Fisheries, and after dry docking left for the surveying ground on May 5th; Rimouski being the most convenient place, was chosen as headquarters for the season.

Triangulation, traversing and sounding were carried on in the vicinity of Ste. Flavie, on the south shore, and Cape Columbia on the north.

The re-survey of the lower St. Lawrence is now complete from the westward to this point.

Commander Miles reports the following work done: Sounding from the boat, 600 miles; and 750 miles from the ship. Total area covered, 580 square miles.

As a result of the above survey a chart will be issued of that portion of the river from Escoumains islet to Ste. Flavie.

The weather during the past season in this district was the worst for many years. Little work of any sort was accomplished in May and October. The *Cartier* returned to Quebec towards the end of October and laid up for the winter. The crew were paid off, and the staff returned to headquarters to plot the season's work and prepare charts for the engraver.

Commander Miles resigned from this survey in March to accept a position with the Admiralty, after some seven years of most efficient service.

PACIFIC COAST.

This survey is in charge of Capt. P. C. Musgrave, who has for assistants, Messrs. Louis Davies, O. Parker, and R. L. Fortier; Capt. F. H. Griffiths, as sailing master and pilot, and Mr. A. R. Borrowman, as chief engineer.

On April 10th, the steamer *Lillooet*, with party on board, left Esquimalt for Nanaimo, and after coaling proceeded north to Ocean Falls, Cousins inlet, where she arrived on the 15th. The survey of Cousins inlet and Fisher channel, commenced the previous year, was resumed and successfully completed on May 13th; also a plan of Ocean Falls on a large scale. After coaling at Prince Rupert, Granby bay, Observatory inlet, was reached on May 16th. Work was at once begun on the survey of Granby bay and its approaches. A large copper mine is in the vicinity. There are two wharfs, and it is a port of call for most of the coasting steamers. This survey was completed on June 22nd, when the ship proceeded to Prince Rupert for coal.

Pacofi-Selwyn inlet, Queen Charlotte island, was reached on June 25th, and the survey of the harbour, which was begun the previous year, resumed. One assistant was left in camp in Rock Fish harbour to complete this survey and commence that of Selwyn inlet. The ship proceeded to Queen Charlotte city, Graham island, on the 29th June, and remained there for Dominion Day.

The first three weeks of July were spent in the triangulation of Hecate strait, which presented some difficulty from the distance across and the great difficulty of landing at some of the points necessary to observe from, except in calm weather.

On July 22nd the sounding of Hecate strait from Lawn Point, Skidegate, to the northward, by the ship and one launch was commenced. On July 25th the ship proceeded to Pacofi to pick up the camp party, the survey of this place having been completed. Until 7th August the work of triangulating Hecate strait was again carried on, the ship calling at Prince Rupert for coal on August 2nd.

From August 8th until September 9th the deep sounding to the westward of Dixon Entrance was proceeded with. Fog and haze greatly hindered this work. Meanwhile, a party was left at Otard bay on the west coast of Graham island for the survey of the harbour, which was completed on September 7th.

The coast triangulation of Graham and Moresby islands was completed by September 21st, and the remainder of the month occupied in the sounding of Hecate strait.

Shortage of coal, owing to the coal strike, necessitated the ship being laid up during the first half of October at Queen Charlotte city, when the triangulation and coast line of Skidegate inlet was completed. Coal having been obtained from the Marine and Fisheries station on Digby island, and the survey of Selwyn inlet considerably advanced, the ship left for the south, arriving at Esquimalt on November 4th. The ship was laid up, crew paid off and the staff began the preparation of the charts for the engraver in the office in H. M. C. Dockyard.

On November 10th, a party proceeded to Alberni and the survey of Stamp harbour and the Somass river was commenced.

In spite of the very unfavourable weather, considerable progress was made by December 10th, when the party returned to Esquimalt.

The following is a summary of the charts and plans completed this season:—

Cousins inlet and Fisher channel, on scale of 2 in. to the sea mile.

Ocean Falls	"	6	"
Granby bay and approaches	"	3	"
Pacofi harbour	"	6	"
Otard bay	"	4	"
Soundings in Dixon Entrance	"	1	"
Thurston bay, Selwyn inlet	"	4	"
Selwyn inlet (uncompleted)	"	1	"
Somass river (portion of Stamp Hr.)	"	6	"

The fair sheets of the above are now in course of preparation.

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HUDSON BAY.

During the past season three parties were operating in this region.

The largest party, under Mr. Anderson, in the steamer *Minto*, was engaged in extending the survey of Nelson river and also in Hudson strait.

The second, under Mr. W. E. W. Jackson, in the steamer *Arctic*, was occupied in making a magnetic survey of Hudson bay and strait, taking both land and sea observations.

For the latter part of the season until the beginning of November, both ships under Mr. Anderson were engaged in investigating conditions for navigation in Hudson strait.

The third party, under Mr. H. D. Parizeau, was occupied in making a survey of Rupert bay, James bay, with a view to locating a suitable railway terminus.

Hudson bay hydrographic survey will be dealt with first.

HUDSON-BAY SURVEY.

This survey was in charge of Mr. Frederick Anderson, assisted by Lieut. J. H. Knight, R.N., (Retired), Messrs. H. H. Lawson, A. M. Lacey and E. B. MacColl. Lt. Knight joined the Hydrographic Survey staff in December, 1911, having retired from the Royal Navy after some nine year's service as a surveyor, and rendered very valuable service during the whole trip. Mr. Lawson, having been attached to the Port Nelson party during the previous season, was placed in charge of the shore party. He left for Port Nelson by dog train last March to observe the ice conditions in the spring break-up, also to traverse the shore line, and had a creditable showing when the *Minto* arrived, early in August.

Messrs. Lacey and MacColl, recent college graduates, the former from the Royal Military College and the latter from the University of Toronto, joined the survey last spring and both gave a very good account of themselves.

For the above expedition the Department of Marine and Fisheries again kindly loaned the ice-breaker *Minto*. Capt. Murcheson, master of the vessel, having been granted leave of absence at his own request, he was replaced by Capt. S. W. Bartlett, who served in the dual capacity of sailing master and ice pilot, rendering very valuable service.

Mr. Joseph Ferguson, chief engineer, deserves great credit for his machinery being in first-class condition during the whole trip, and in economy of fuel. Dr. Goodwin, of Halifax, physician and surgeon to the survey, proved to be very proficient, showing good judgment and skill in handling any cases of illness that turned up.

The *Minto* sailed from Halifax on the 24th July, having been unavoidably delayed about two weeks, and Port Nelson was reached on the 6th of August, after an uneventful trip.

Benefiting from last year's experience, care was taken in selecting the track followed to avoid the ice, with the result that the *Minto* encountered less ice than any vessel entering Hudson bay during the past season.

The schooner *Chrissie C. Thomey* was taken in tow at Domino harbour, and dropped in Hudson bay, about 120 miles off Churchill, to make her own way to James bay.

Surveying operations were carried on off Nelson roads until the end of September, with varying success. Fifty per cent of the time was lost through unfavourable weather conditions; however, the sounding was extended some miles off and beyond Nelson shoal, and considerable shoal was traversed.

The past winter was reported as severe, the channel in the river being frozen over until late in May; however, it was open by the end of the month. The field-ice

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did not leave Nelson roads until the middle of July, about a month later than usual.

The latter part of the season was occupied in making investigations concerning the condition of navigation in Hudson strait. For this purpose the *Arctic* was taken over by Mr. Anderson from Mr. Jackson and operated in conjunction with the *Minto*.

The straits were finally cleared on the 6th of November, no ice being in sight, and only one berg passed on the home trip. Halifax was reached on the 11th of November.

The ship was paid off, re-transferred to the Department of Marine and Fisheries, and the survey staff returned to Ottawa to resume office duties.

As a result of this survey, a chart has been published of 'Approaches to Nelson river,' including the entrance to the river as far up as Flamboro head, and extending out beyond Nelson shoal. Also, a chart of 'Anchorage in Hudson strait,' comprising Button islands, Port Burwell, Sugluk inlet, and Erik cove.

Mr. Anderson's report is attached, giving a detailed account of the work accomplished during the trip up and back, and information regarding ice and weather conditions.

JAMES BAY SURVEY.

This survey was in charge of Mr. H. D. Parizeau, assisted by Messrs. Paul Jobin and F. R. Mortimer. The former, an assistant of some years' standing, was attached to Port Nelson survey last season, and the latter, a recent college graduate, joined the survey staff last spring.

Instructions were given to survey Rupert bay, with a view to trying to locate a suitable harbour for a railway terminus, and also gather as much information as possible regarding ice and weather conditions and the natural resources of the district.

The party, consisting of eighteen men in four canoes, left Cochrane, Ont., on the 6th May and arrived at Moose river post of the Revillon Frères Trading Co., on May 11th. A week's delay was caused at Missinabi crossing waiting for the ice in the river to break up. As the ice in Hannah bay prevented further progress, a survey of the Moose river was undertaken from half a mile above the trading post to the foot of Middleboro island.

On the 10th June the party left for Mesakonon point, following the shore line of Hannah bay to avoid the southern limit of the ice.

On the 19th June the survey was begun from Mesakonon point to the eastward. The triangulation extending from Wood island at the head of Rupert bay to the foot of the last rapids of the Nottoway river; 85 miles of coast line was traversed and 183 miles of sounding accomplished. Tidal observations were taken at Rupert House and Stag island.

In addition to the above, various rivers, bays and points were examined and reported on. From the information received it would appear that Comfort point, at the eastern extreme of Ministikawatin, is the most suitable site for a railway terminus.

This is the only place where deep water comes closer into the high water line, and the land in the vicinity is suitable for railway connections, being flat and about ten feet above high water. Sufficient soundings were obtained to show a good channel from Charlton island to this point.

Mr. Parizeau's report is attached, giving full information regarding this district, including material for construction.

Though navigation in James bay usually opens about the 20th June, still it is well into August before the bay can be entered. The northerly winds generally prevailing in Hudson bay in the spring drive all the ice into the south part of the bay, thus closing up the entrance to James Bay. The steamer *Adventure*, after leaving Strutton island last summer encountered very heavy ice off the Bear islands as late as the 25th August.

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The survey was greatly hampered in operations through shortage of gasoline, occasioned by the non-arrival of the schooner *Chrissie C. Thomey*. This vessel was dropped in Hudson bay by the steamer *Minto* on the 5th August with a fair wind for James bay, but she did not arrive at Stag island until the 1st October, on account of the ice encountered.

Navigation in James bay generally closes about the end of November.

The party left Moose factory by dog train on the 6th January by way of the Abitibi and Frederick House rivers and arrived at Cochrane on the 16th January, where the men were paid off and the officers returned to Ottawa, having been engaged plotting the season's work and preparing reports.

HUDSON BAY MAGNETIC SURVEY.

This survey was in charge of Mr. W. E. W. Jackson, assisted by Mr. W. B. Wiegand, in the steamer *Arctic*, with Capt. Joseph Couillard, as master, and John Keonig as chief engineer. The steamer *Arctic* was loaned by the Department of Marine and Fisheries for the above expedition. She fitted out at Quebec, and after taking on coal and provisions proceeded to sea on June 27th.

Mr. Jackson reports the following:—

‘In the vicinity of Rimouski I swung ship for the purpose of establishing the deviation constants of our compasses, and then proceeded with as little delay as possible to Hudson strait, observing for magnetic declination whenever the weather was favourable. Great quantities of ice along the Labrador coast caused considerable delay, and it was not until the 16th of July that the vessel reached the eastern entrance of Hudson strait.

‘While passing through the strait from the 16th to the 28th of July the ship was more or less continuously buffeted by the ice, but on the afternoon of the 28th the open water of Hudson bay was reached. An unsuccessful attempt was made to land on Coates island, near Cape Southampton, after which Marble island, Churchill and Nelson were visited in succession, and magnetic observations were made in each place.

‘From the Nelson river our course was shaped for the Ottawa islands, but stress of weather forced us to abandon any attempt to land there or at Smith island, and we proceeded to Hudson strait via the passage between Mansell island and the mainland.

‘While crossing Hudson bay soundings were made about every ten miles, and observations for magnetic declination at every opportunity.

‘In the straits, Port Laperriere, Nottingham island, Sugluk bay, Ashe inlet, Stupart bay, and Port Burwell were visited for the purpose of securing land observations of the magnetic elements, and when at sea and weather was found favourable, declination observations were made.’

On the 25th of September, the *Beothic* reached Port Burwell and gave the *Arctic* a fresh supply of coal. The *Minto* arrived on 4th October and, as already stated, the *Arctic* was operated in conjunction with her, observing ice conditions in the straits for the balance of the season. The *Arctic* finally left Port Burwell homeward bound on November 6., arriving at Queen's wharf, Quebec, on November 16. The crew was paid off and the ship handed over again to the agent of the Department of Marine and Fisheries.

As a result of the above survey new lines of magnetic declination have been laid down for Hudson bay and strait. Accompanying this report are the following:—

Magnetic observations at land stations.

Magnetic observations at sea.

Secular change in magnetic declination.

Charts of lines of equal magnetic declination for Hudson bay and strait for 1912.

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ST. LAWRENCE RIVER.

A small party, in charge of Mr. Charles McGreevy, in a hired gasoline launch, was engaged in connecting up the river St. Lawrence main triangulation with that of lake St. Louis, and also taking topography on both sides of the river in the vicinity of Lachine and Chughnawaga.

During the year the following new charts have been issued:—

- No. 98, Cove island to Duck island.
- No. 97, Duck island to Detour passage.
- No. 96, Cape Hurd to Gull island.
- No. 305, Masset inlet.
- No. 304, Arthur and Telegraph passages.
- No. 54, Lake of Two Mountains (east end).
- No. 55, “ “ “ “ (west end).
- No. 401, Port Churchill.
- No. 404, Anchorages in Hudson strait.
- No. 206, The Traverses.
- St. Lawrence Pilot, above and below Quebec.

A second edition of the following chart was issued:—

- No. 20, St. Nicholas to Quebec bridge.
- 2,739 charts in all were issued during the year.

I am, sir,

Your obedient servant,

F. ANDERSON,
For Chief Hydrographer.

SECULAR CHANGE.

The accompanying tables indicate the changes which have occurred in the magnetic elements through the lapse of time.

At Port Burwell, Ashe inlet, and Stupart bay, the same identical location was used in the different years, and in these places only can any reliance be placed in the secular change data. At the remaining stations the locations of former observers could not be found and new ones were chosen, and this is probably the cause of the discrepancies appearing in the results at these stations, which is particularly noticeable in the inclination at Marble island and Churchill.

The secular change in declination is at present about +9' or +10' at the eastern end of Hudson strait, and this gradually diminishes to almost zero at the western side of Hudson bay. That is to say, the isogonic lines in Hudson strait are now moving east and north, whilst on the western side of Hudson bay they are practically stationary.

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SUMMARY OF MAGNETIC OBSERVATIONS TAKEN ON LAND, C.G.S. - ARCTIC

(Made by Authority of the Department of the Naval Service.)

Station.	Latitude North.		Longitude West.		Date.	Declination - West + East.		Inclination North.	Horizontal Force, C. G. S. units.	Total force, C. G. S. units.	Observer's range in D.
Quebec	46	48.1	71	13.7	1912.47	-18	24.3	+75	57.8	0.14738	
Rimouski	48	30	68	31	49	-23	01.0				
Battle Harbour. . .	52	16.4	55	34.6	51	-35	25.2	+76	09.3	0.13510	
Marble Island . . .	62	40.3	91	08.9	59	-7	39.6	+87	16.0	0.03029	0.63308 81.2
Fort Churchill. . . .	58	46.2	94	10.4	60	+9	28.8	+84	39.7	0.06228	0.63472 97.5
York Factory.	56	59.6	92	10.0	62	+5	06.9	+83	36.8	0.07218	0.63467
Port Laperriere. . .	62	35.9	77	55.6	66	-40	13.5	+85	40.4	0.04832	0.61720 107.0
Nottingham Is. . . .	63	15.3	77	23.8	66	-51	10.1	+85	06.5	0.05180	0.60815
Sugluk Bay	62	14.0	75	32.9	67	-47	43.3	+84	24.6	0.05875	0.60900 59.3
Ashe Inlet	62	34.2	70	28.8	68	-51	57.8	+83	39.9	0.06647	0.60806 58.0
Stupart Bay.	61	35.2	71	30.8	69	-49	55.4	+83	37.3	0.06687	0.60324 55.0
Port Burwell.	60	24.8	64	41.9	72	-43	25.8	+81	35.8	0.08510	0.59602 38.8

Observations all corrected to Toronto standard.

Observers :—W. E. W. JACKSON.
W. B. WIEGAUD.

MAGNETIC DECLINATION.

Station.	Date.	D.	Date.	D.	Secular Change.
Port Burwell	1884.6	-49 28	1909.7	-44 1	+ 13.0
" "	1909.7	-44 1	1912.7	-43 34	+ 9.0
Ashe Inlet	1909.7	-52 31	1912.7	-51 57	+ 11.3
Stupart Bay.	1885.1	-54 12	1912.7	-49 57	+ 9.2
Nottingham Island.	1884.7	-52 30	1912.7	-51 10	+ 2.8
Marble Island.	1884.6	-8 40	1912.6	-7 40	+ 2.1
Battle Harbour	1905.6	-35 22	1912.5	-35 26	- 0.5

MAGNETIC INCLINATION.

Port Burwell.	1884.6	+82 23.5	1909.7	+82 6.5	- 0.7
" "	1909.7	+82 6.5	1912.7	+81 35.8	10.2
Ashe Inlet.	1884.6	+84 16.0	1909.7	+83 56.0	0.8
" "	1909.7	+83 56.0	1912.7	+83 39.9	5.7
Stupart Bay	1885.3	+84 5.2	1912.7	+83 37.3	1.0
Nottingham Island.	1884.7	+86 1.7	1912.7	+85 6.5	2.0
Port Laperriere	1884.7	+85 54.0	1912.7	+85 40.4	0.5
Marble Island.	1884.6	+84 20.0	1912.6	+87 16.0	6.2
Churchill.	1910.8	84 33.4	1912.6	+84 39.7	+ 3.5

HORIZONTAL FORCE 1γ=1 C.G.S. unit x 10⁻³.

Port Burwell.	1909.7	8 390	1912.7	8 510	7 40
Ashe Inlet.	1909.7	6 630	1912.7	6 647	6
Stupart Bay.	1885.2	6 240	1912.7	6 687	16
Nottingham Island.	1884.7	4 340	1912.7	5 180	30
Churchill.	1910.8	6 043	1912.6	6 228	100

Data for 1884-5 from Lieut. Gordon's Report of Hudson Bay Expedition.
Data for 1905, Battle Harbour, supplied by Carnegie Institution of Washington.
Data for 1910, Churchill, MSS. of Mr. Savary.
Data of 1909, MSS. of W. E. W. Jackson.

SUMMARY OF MAGNETIC OBSERVATIONS TAKEN AT SEA. C.G.S. "ARCTIC".
(Made by authority of the Department of the Naval Service.)

Date.	Latitude N.		Longitude W.		Declination East: West:	
July 2	49	06	61	22	-27	7
3	50	26	58	32	-33	8
13	56	24	56	07	-36	7
13	56	41	56	55	-37	1
2	49	37	60	22	-28	3
11	57	31	59	57	-41	5
14	58	27	61	48	-42	3
15	60	42	64	08	-43	1
16	61	10	65	20	-47	5
17	61	10	66	20	-45	5
17	61	10	67	43	-47	5
18	61	13	68	05	-50	0
19	61	13	68	06	-47	5
20	62	28	72	10	-49	7
25	62	48	78	59	-47	7
28	61	56	81	50	-34	9
29	62	04	83	14	-32	4
29	62	10	83	38	-32	3
30	62	02	84	45	-28	3
30	62	10	87	34	-12	8
31	61	40	92	03	+1	3
Aug. 3	61	15	92	20	+4	8
3	60	56	92	38	+4	7
3	60	16	93	44	+10	3
4	59	35	93	48	+9	1
4	58	59	92	21	+6	7
8	58	29	91	49	+3	4
8	57	41	91	38	+5	2
9	57	07	92	35	+7	1
14	57	50	90	55	+1	3
17	58	05	90	40	+2	5
18	58	05	90	30	+1	6
18	59	33	86	32	-15	9
22	59	30	85	20	-15	5
23	59	30	85	17	-14	0
23	61	22	79	49	-36	3
25	62	30	79	02	-43	5
26	62	37	78	09	-43	6
27	62	36	77	56	-40	8
29	63	15	77	23	-50	7
30	62	29	75	29	-49	1
31	62	15	75	32	-47	1
Sept. 1	62	22	75	20	-45	5
6	61	43	71	22	-48	1
10	61	55	68	21	-48	2
11	61	31	67	31	-48	4
11	60	24	64	44	-46	3
12	60	25	64	42	-43	2
23	60	25	64	42	-41	9
25	61	15	65	02	-45	4
Oct. 6						

DEPARTMENT OF THE NAVAL SERVICE—HYDROGRAPHIC SURVEY.

OTTAWA, May 23, 1913.

W. J. STEWART, Esq., C.E.,
Chief Hydrographer, Dept. Naval Service,
Ottawa.

SIR,—I beg to submit the following report on the work of the survey in Hudson bay and strait.

The steamer *Minto* fitted out at H.M.C. Dockyard, Halifax, during June, and was due to sail about the first week in July; however, at the last moment, a defect developed in the rudder stock, necessitating a delay of about two weeks for repairs.

On July 24th, all arrangements having been completed, and coal and provisions taken on board, the *Minto* left the dockyard at noon.

The compasses were adjusted in the outer harbour, and at 3.15 course was shaped abreast Devil island. The weather was fine, and after an uneventful trip, Forteau bay on the Labrador coast was reached at 10 p.m. on Friday the 26th. Though raining and hardly a very cheerful evening, the mail was landed and steam taken at 3.30 a.m.

Fresh wind from the southeast prevailed and many scattered icebergs were passed in the straits of Belle isle.

Domino harbour was reached at 4.15 a.m. on Sunday the 28th, and just in time, because it closed down very foggy shortly after the *Minto* had come to anchor.

The schooner *Chrissie C. Thomey* was found awaiting our arrival. She had fitted out at Halifax for James bay and sailed on June 17 to procure sleigh dogs on the Labrador coast to assist the return trip overland of the James Bay survey party in the early winter. Dogs were scarce, however, thirty-six were secured. Mail was landed here also, and reports sent to Ottawa by wireless.

The fog having lifted considerably, Domino harbour was cleared by 4.30 p.m., with the schooner *Christie C. Thomey* in tow. A southeast course was held for about forty-eight miles in order to stand well off shore and thus clear the field ice generally to be found along the Labrador coast at that time of year. The course taken passed about ninety miles off Nain village; an occasional berg was passed, but no field ice.

Cape Chidley was sighted at 5.30 p.m. on Wednesday, July 31, at about twenty miles distance, and the *Minto* came to in Port Burwell harbour at 9 p.m. Scattered pans of ice were seen about the Button islands when passing through the straits, but the passage was quite clear.

The Moravian missionary came on board and reported that the winter had been very mild and that a vessel could have entered Hudson straits as early as June 15.

Steam was taken at daylight, and about 9 a.m. the ship was swung and the compasses were found in good condition.

The first field ice was encountered at 8.30 a.m. on August 2, about thirty miles east of cape Prince of Wales, and the same distance off shore. No difficulty was experienced in pushing through, even with a schooner in tow. The temperature was 32 F. at 3 p.m. A large polar bear was seen sitting on a pan of ice off Wakeham bay later in the evening.

A fire was noticed on one of the islands about twenty miles west of Wakeham bay, evidently some natives cooking their evening meal.

The next day was very fine and calm, light field ice was passed off Sugluk inlet, but not to any extent.

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Sunday, August 4. — A very fine day, light breeze from the southwest. Field ice was noticed about five miles to the northward, abreast Coates island, and when about sixty miles farther to the westward, large fields of ice were sighted to the southward. Therefore course was held 15 points to the north, clearing everything. The following day also proved to be exceptionally fine, light southerly wind and warm. No ice in sight.

The schooner *Chrissie C. Thomey* was cast off from the tow line during the morning in Lat. $60^{\circ} 50' N.$, and Long. $88^{\circ} 55' W.$, having a fair wind for James bay.

Towards evening of the same day the schooner entered a field of ice and remained practically ice-bound until September 22, when she cleared it and made Charlton Island, James Bay, on the first of October. When Hudson bay ice breaks up in the spring the prevailing northerly winds drive it into James bay, thus closing up the entrance. Fox channel ice and bergs will also be found in this locality.

In lat. $59-45$, long. $92-28$, considerable magnetic disturbance was noticed, the standard compass swinging 10° . A sounding being taken showed 48 fathoms water over mud and gravel bottom. This disturbance was noticed gradually lessening in intensity for about 5 miles to the westward.

Towards evening the *Arctic*, at Churchill, about 60 miles distant, was picked up by wireless, and the information received that the *Beothic* had left on the 30th, bound for Nelson river. As this steamer had a further supply of coal, course was immediately altered for Port Nelson, arriving off Nelson shoal on the following morning, August 6. The day was spent making an examination of the locality, and on the following day at 3 p.m. the *Minto* tied up alongside the *Beothic* riding at anchor in the deep channel at the entrance to Nelson river, and about eight miles outside the site of the proposed terminal.

Mr. H. H. Lawson, officer in charge of Port Nelson shore party, was on board the *Beothic*, having joined her outside to assist in finding the narrow channel at the entrance to the river. Mr. Lawson had left Ottawa for Winnipeg on the 17th February, and after completing all arrangements for men and outfit, which were to be assembled at Gimli on the west shore of lake Winnipeg, he finally set out by dog train on the 29th February, arriving at York Factory on Hudson bay on the 25th March. The trip was made under exceptionally favourable conditions. The temperature being below zero the trail was good, weather clear, no head winds, consequently good progress was made each day.

Shortly after reaching York Factory, camp was taken up at Root creek on the northwest side of the entrance to Nelson river, and about eight miles outside Flamboro head. Mr. Lawson reports the following:—

‘On April 1st, this locality had the general appearance of mid-winter. The ice in the channel was comparatively smooth, but, for a distance of a quarter of a mile from the shore on the north side and two miles from the south side, the fall ice had been piled up to a height of 15 or 20 feet. The great difference in the shore ice on the two sides of the river was due to the prevalence of northerly winds.

‘At Root creek there was least shore ice, hardly a quarter of a mile off, but, a little above, it extended out half a mile, and it gradually made out until at Sam creek it reached the channel, four or five miles off shore.

‘On the shoals extending out to the channel about the line Sam creek to Marsh point beacon, a barrier of ice was piled up to a height of from 30 to 40 feet, and York roads were apparently frozen for a distance of twenty miles outside this line.

‘Early in May, most of the snow had disappeared on the land, but little change was noticed on the river until about the 15th, when cracks appeared and the ice was much honeycombed.

‘On the 18th, tide was first noticed at Root creek, the channel ice rising and falling with the tide.

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On the 31st, the channel was clear of ice at low water as far up as Plum-boro head.

One point worthy of note is that in the break-up no particular shock or crushing was noticed, the river breaking up as quietly as a lake. The ice was continually carried back again with the flood tide on account of the northerly winds, until June 10, after which date it did not return again in any quantity.

The roads outside were held full of ice until July 11. The natives and Hudson's Bay Company reported that this was an exceptional year, because the entrance to the river was seldom frozen beyond Sam creek.

The river and roads also are generally free from ice early in June.

On the previous fall the river did not freeze up until the end of December, and during November the drift ice was of little account to a steamer of any size.

Tidal observations were first taken at Root creek on the 17th June."

The entrance to the Nelson river does not generally freeze up until the end of December or first of January, and occasionally remains open all winter. Still, the heavy drift ice coming down makes it unsafe for any vessel to ride at anchor in the channel. The river ought to be safe for navigation from the middle of June until the 1st December.

While coaling, a supply of fresh water was taken on at three-quarters ebb tide. The water was perfectly clear, with no apparent sediment in suspension, showing that very little silt is carried down by the Nelson.

On the morning of the 10th August, coaling being completed and mail handed to the *Beothic*, the *Minto* moved outside into Nelson roads, where the *Arctic* was met with, having just arrived from Churchill. The *Beothic* passed out the same evening, bound for James bay, and a few hours later reported by wireless that she was making very little headway in a field of heavy ice. On Tuesday the 13th the wind was very fresh from the north and, as the current held the *Minto* broadside to the weather, heavy seas were breaking over the decks. Bags filled with seal oil were used to good advantage on the weather side, smoothing the water considerably and preventing further seas from breaking on board.

Surveying operations were carried on from the 12th August until the 20th September; during that period the weather was fair for navigation. Still, fifty per cent of the time was lost through fog, rain and fresh winds, when it was impossible to work in that exposed locality. The prevailing winds were from the northwest, east and southeast.

The following new ground was covered: The shore traverse was extended from Sam creek for about twenty miles, or past Nelson shoal. Sounding was extended from the limit of last year's work to about six miles past and seven miles off Nelson shoal, covering an area of about 100 square miles, and about 900 miles of line sounding. All this sounding was done from a gasoline launch, as it was hardly possible to operate the ship in that locality.

The shore being very low, seldom exceeding one foot above high water, nothing could be seen when a few miles off, therefore steel buoys carrying flags about twenty feet high and visible six miles, were used to good advantage in fixing the position of the ship and soundings.

The method adopted under the above conditions for fixing the soundings was as follows: The ship being anchored in a convenient place was fixed by sextant angles taken to shore stations visible and all buoys possible to see. Taking the ship as a centre, radiating lines about eight to ten degrees apart were carried from two to three miles off, thus covering a circle about five miles in diameter at each point.

Dories carrying flags were anchored about half a mile from the ship to give the line, and the launch, when sounding, was cut in for the ship by sextant angles and the distance from the ship obtained by a ship's masthead angle taken from the launch.

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A canvas disc, four feet in diameter, painted black, was hoisted to the mainmast head, that it may be easily distinguished at a distance.

By this method from sixty to seventy miles could be sounded on a calm day, thus covering the ground quickly and efficiently, which is most essential in a district with a short season like Hudson bay.

NELSON SHOAL.

Nelson shoal with its highest part lying N. 46 W. (true) 31.8 miles from Marsh Point beacon, and eight miles from the nearest land, which is extremely low, being only one foot above high water, and in many places covered by spring tides, is composed of gravel with occasional large boulders. It dries to a height of sixteen feet at L.W. springs, uncovering an area about five miles long, north and south, and one mile across. It is covered with a depth of two feet water at H.W. springs; however, a small area remains uncovered at neap tides. A beacon, thirty feet in height, was erected there last season, supported by heavy guy wires, which proved of great assistance to the survey. When the *Minto* left that locality at the end of September it was still standing and in good condition, but it remains to be seen in the coming summer how it has fared during the winter.

In approaching this shore, great care should be exercised and the lead kept going not to shoal to less than ten fathoms, as nothing can be seen of the main shore and the shoal may be covered.

During the morning of August 19, while riding at anchor off the south side Nelson shore a wireless message was received from the *Stanley* that she was approaching, and at 6.15 p.m. she came to off the *Minto*. Capt. Dalton reported a very stormy trip up, especially in Hudson straits near Eric cove. She passed east of Mansel island and encountered a great deal of field ice, which would have very likely been avoided by leaving the island to the southward. On the following morning Capt. Bartlett piloted the *Stanley* to a position a few miles off Marsh Point beacon for convenience in landing.

The *Stanley* again appeared alongside on August 23, bound for Churchill and home with the Honourable Mr. Cochrane on board.

On Tuesday, September 9, two invalids, Percy F. Broughton, missionary from Lake Harbour, Baffin land, who had been frozen severely about the body and feet last March, and the fourth engineer of the vessel, who had taken a bad hemorrhage, were received on board from the *Nascopie* (carrying Hudson's Bay Company supplies). Dr. Goodwin, of the *Minto*, reported these men in a critical condition, and that, unless they received proper medical attention at once, there was little hope for their lives. By careful treatment they improved greatly and were transferred to the *Beothic* later, to be taken home.

Before leaving Ottawa, instructions had been received to keep a lookout for the crew of the schooner *Seduissante*, which was supposed to have been lost. Mr. Broughton, missionary from Lake Harbour, furnished me with the following account of the wreck of this vessel, with all hands on board, which he had received from the natives who were on board at the time and made their way to Lake Harbour in the spring:—

About the 24th September, 1911, the schooner *Seduissante*, under the command of O. C. Forsyth Grant, bound for the Ottawa islands on the east shore of Hudson bay, to take up whaling, stranded off the east part of Nottingham island, in the western entrance of Hudson straits. Although snowing at the time the weather was fair, and Mr. Grant had hopes of floating his vessel again. He landed the greater part of his cargo, consisting of walrus hides and tusks, whalebone, etc. The natives, about sixty in number, refused to remain on board as they did not consider it safe.

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'Next morning the natives returned and tried to induce Mr. Grant to abandon his vessel, but without avail. Later in the day a heavy gale set in from the northeast, accompanied by snow. The crew of the schooner could be seen from the shore by the natives, calling for assistance, but nothing could be done at that time owing to the very heavy sea. The vessel finally disappeared, and all hands were lost.

'The bodies of the captain and chief engineer only were recovered and buried under a large pile of stones on the shore of the island.

'The natives were forced to remain on Nottingham island all winter and had a very hard time obtaining food. They had very little ammunition and, when that was exhausted, made bows and arrows to obtain moose meat.

'In the spring, the natives made their way to Lake Harbour, Baffin land, on the north shore of Hudson straits.'

Mr. Grant's headquarters were at Cape Haven, on the east coast of Baffin land, a little north of Frobisher bay, where I understand he had a depot of supplies and furs.

The last work was done at Port Nelson on the 19th September, and on the following morning, to economize fuel, which was getting low, and to take on fresh water, the ship moved into the narrow deep channel off the entrance to Nelson river, where good shelter was found from any wind.

Tidal records were received from the terminus party. The coaler *Beothic* was anxiously awaited; however, on the 28th, the steam coal on board being reduced to 155 tons, it was considered unwise to remain longer as the *Minto* had consumed 240 tons on the trip up, and it was decided to depart for the season. The buoys were lifted and course was shaped from Nelson shoal for the north end Mansel island.

The weather was exceedingly fine and a speed of eight knots was made on a consumption of twelve tons of fuel in twenty-four hours, rather exceptional for the *Minto*. Eric cove was reached on Tuesday evening, October 1, where the information was received that the coaler *Beothic* had been seen entering the bay on Sunday morning. This was very unfortunate as we must have passed her in the middle of Hudson bay, which can only be accounted for by the poor wireless outfit on the *Minto*.

On Thursday evening, the *Arctic*, lying in Port Burwell, was picked up by wireless, and the *Minto* arrived on the following morning, October 4.

The trip from Nelson was quite uneventful; the weather was exceptionally fine and clear, no field ice being seen, and only an occasional iceberg in the strait. As Mr. Jackson had finished his magnetic investigations for the season, the *Arctic* was taken over from him to be operated in conjunction with the *Minto*, observing general conditions for navigation in Hudson strait for the balance of the season.

After receiving coal from the *Arctic*, the *Minto* proceeded to the Button islands and came to in a fair anchorage discovered amongst the islands. A survey was made of the locality, and a plan has been published. The *Arctic* proceeded to Resolution island to make examination for suitable harbours, but without much success, as the weather was very broken, and she returned to Port Burwell on the 8th.

The difference of longitude between the Button islands and Port Burwell was obtained by wireless signals exchanged between the *Minto* at the former place and the *Arctic* at the latter.

The Revenue cutter *Arthur W.*, in command of Capt. Chapman, arrived at Port Burwell on the 12th to winter there, and then proceed into Ungava bay and various ports on the straits, on the opening of navigation.

Button islands (see Canadian chart No. 404), lying in the eastern entrance to Hudson straits and separated from the northeast entrance point of Ungava bay by Grey strait, which is three and one-half miles across, are composed of two groups of bare rocks separated by a deep channel, some two miles in width. The northwestern, or larger group, is made up of two main islands, Lawson and McColl, (the former

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being the highest point of the Buttons, 812 feet above (from water), also a number of small islands or rocks.

The whole group trends in a general northeast and southwest direction about nine miles and about five miles across.

The smaller, or Knight group, consists of one larger irregular island about two miles across, over 600 feet high, and several smaller islands and rocks off the south side.

Anchorage for twenty millions of water may be found in the Button islands, between McColl and Lawson islands, towards the south and just east of Observation island. However, a lookout must be kept for icebergs which occasionally pass down the channel and would very likely make trouble for a vessel, if caught.

The *Woodsenys* anchored in this harbour for twenty days without inconvenience; however, one iceberg came down the channel uncomfortably close, but the change of tide carried it away and it finally grounded on a shoal.

Labrador reef, the only outstanding danger in this locality, lies S 54° E. (true), seven miles from the northern extreme of the Buttons and N. 47° E. (true), five miles from the southeastern island of the Knight group.

Though this reef is of considerable extent, and dries in places at low tide, still, being covered by about sixteen feet of water at high tide, it is a very dangerous spot and a sharp lookout ought to be kept for it when approaching the Buttons from the eastward in thick weather. When Grey strait is open at all you are clear of this shoal.

The current passes through Grey strait at a rate of from five to seven knots making many eddys about the islands and many low-powered steam or almost any vessel would do well to wait for a favourable tide before attempting the passage—or make into Hudson strait well north of the islands.

While at the Button islands, the weather was fair, on the whole, though occasionally fresh winds and snow flurries, but nothing to interfere with general navigation.

The *Beothic* arrived at Port Burwell on the morning of October 25; Captain Wayte reported that on October 22 the passage between Coates and Mansel islands was almost closed with field ice; however, they managed to pass through without difficulty. On Tuesday, October 29, having finished coaling and transferred the invalids and mail to the *Beothic*, the *Minto* left Burwell for Mansel island to investigate ice conditions.

The *Arctic*, being a very low-powered vessel, it was considered unwise to allow her to accompany the *Minto*; therefore, she remained in Burwell to observe ice movements at the entrance to the straits, and examine harbours.

On the following day we came to in Sugluk inlet at 2.30 p.m. Fresh ice was noticed making along the shore, and there were several inches of snow covering the hills.

Sugluk was cleared at 8.15 in the morning and Eric cove was reached at noon.

Some valuable records regarding ice-movements in this locality were received from Mr. Shepherd, officer in charge of the Hudson's Bay company's post, and arrangements were made with him for keeping a journal of the ice movements and weather conditions during the winter, taking careful note of the dates of closing and opening of navigation. The whole passage across is visible from the highland at Cape Wolstenholm; therefore, very reliable information ought to be obtained.

New ice was found on the bank at the head of the bay along the shore, and on the morning of the 2nd it was found forming about the ship. The harbour was cleared at 7 a.m., and when abreast Digges islands, course was shaped for some miles north of Mansel island.

The weather was fine, calm and clear. We occasionally passed through masses of slush but no field ice was sighted from the masthead.

At noon the *Minto* lay north by east twenty-five miles off the north end of Mansel island, and though this is the latest date on record for any steamer being in this locality there was no ice visible from the masthead, the weather was clear and conditions most favourable for navigation.

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Eric cove was reached at 6.30 p.m. and cleared again at 4 a.m. on the following morning, and we came to again in Port Burwell at 3.30 p.m. on Monday, November 4, where the *Arctic* awaited our arrival. The passage through the straits was very fair, fresh west wind, an occasional berg passed, but no field ice.

Arrangements were made at Burwell that the ice movements in the entrance to the straits should be observed during the winter from the highland where the whole passage across to Resolution island can be seen in clear weather, careful attention to be paid to the dates of closing and opening of navigation.

The *Minto* left Port Burwell on the morning of November 6 and as the wind was fresh from the west, and very unfavourable for a low-powered vessel like the *Arctic*, she was taken in tow, and dropped with a fair wind when clear of Grey straits.

Belle Isle was reached at noon on Friday the 8th, having made the trip from Cape Chidley in forty-six hours, a distance of 600 miles; only one iceberg was sighted, and no field ice. The course held was well off shore.

After passing Belle Isle the worst weather and sea of the whole season was met with in the gulf of St. Lawrence. The ship was checked to a speed of six knots, because several seas were shipped over the bridge deck and there was great danger of losing a launch, placed on the main deck forward.

The *Minto* arrived at Halifax at 8 a.m. on Monday, 11th November. The stores were placed ashore, the crew paid off and the ship was handed over again to the Agent of the Department of Marine and Fisheries.

NAVIGATION INTO HUDSON BAY.

There appears to be sufficient information on hand now to form a fair idea of the general ice conditions in this region and to decide upon the period during which Hudson bay and strait can be navigated with comparative safety.

Winter conditions generally prevail in Hudson bay until the latter part of June and the heat of the sun does not loosen up the ice sufficiently to make navigation safe until the middle of July.

For the past 200 years all records agree that Hudson strait is more or less filled with heavy drift ice and bergs during the first half of July and that there would be little advantage entering before the middle of the month. Hudson bay and strait do not freeze across, but are so covered with masses of ice that navigation is practically impossible for seven months of the year. During the winter months the intense cold forms a thick haze over the ice making it impossible to pick up and take advantage of any open leads through the ice pack. Practically the same conditions prevail later in the spring, from the heat of the sun over the ice.

During the early part of the season, northerly winds generally prevail in Hudson bay, and when the ice is sufficiently loosened up it is all carried to the southern end of the bay, very effectually closing up James bay until well into August. About the middle of last August, icebergs and Arctic ice were found in this locality, greatly hampering navigation.

The entrance to Nelson river on the west side of the bay is generally clear of ice about the middle of June, and the latter part of November can be taken as the close of the season.

Entering Hudson strait in the spring when ice is present, the north shore had better be given a wide berth as the strong tidal currents exert considerable pressure and render navigation extremely dangerous. Mid channel had better be taken until Charles island is reached, when a clear passage will generally be found close along the bold south shore. This course can be held until past Mansel island, when a northerly course will generally give a clear passage.

The closing of navigation is mainly controlled by the northern ice pack from Baffin bay, which is carried across the entrance of the strait by the main stream of

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the Arctic current, and passes down the Labrador coast. This pack is composed of Arctic ice and icebergs, and is from fifty to seventy-five miles in width.

As a protection to navigation, a powerful sea-going tug equipped with wireless could keep in touch with this pack that vessels might be informed of its progress and thus clear the strait in time. From information received at Port Burwell, extending over a number of years, the northern ice generally closes up the entrance to the strait by the latter part of November. A small portion of this ice field is forced through Gabriel strait and carried well through Hudson strait by the westerly current along the north shore.

The Fox channel ice renders the western entrance of the strait a point of much concern, not only as to the closing of navigation, but also during the season, fields of heavy ice may be met with here at any time. However, this ice may only remain for a short period, being mostly carried out of Hudson strait by the easterly current along the south shore, a portion passing into Hudson bay; but the final destination of this ice depends largely upon the direction of the wind.

Last fall, about the end of October, the steamer *Beothic* reported the passage between Mansel and Coates islands almost closed. However, a little later, this field was seen passing out of the strait and there was no ice to be seen when the steamer *Minto* arrived in this locality on November the 2nd.

From the above, the period during which vessels could enter Hudson strait with comparative safety may be taken to extend from July 15 until November 15, with an extension of a week at either end, according to the season.

On account of the presence of ice in Hudson strait at any time of the year, vessels trading in there ought to have their bows specially strengthened to resist the ice. A sharp lookout must be kept at all times, because not only icebergs and fields of ice but isolated masses of hard ice, called 'growlers,' may be met with, and as they float little above the surface they are very difficult to see, especially at night, and a vessel coming in contact with one might receive serious damage.

Accompanying this report are the following:—

Summary of ice met with by the different steamers navigating Hudson bay and strait during the season of 1912.

Table of Meteorological Observations taken on board the *Minto*, 1912.

Summary of Meteorological Observations taken at Port Burwell, 1907-10.

Ice conditions as observed from Eric cove, 1910-12.

Summary of weather conditions at Eric cove, 1910-12.

I am, sir,

Your obedient servant.

F. ANDERSON.

Officer in charge, Hudson Bay Surrey.

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SUMMARY OF ICE MET WITH BY THE FOLLOWING STEAMERS DURING
THE SEASON OF 1912, IN HUDSON BAY AND STRAIT,
AND ENTRANCE TO JAMES BAY.

(EXTRACTS FROM SHIPS' LOGS.)

SS. 'BEOTHIC.'

Icebergs were first seen in Belle Isle strait on July 10. Heavy field ice was encountered next day from the east end of the strait continuously to Cape Chidley, reached July 14, with icebergs and much fog, which sometimes necessitated the stopping of the ship. The track followed was close along the Labrador coast. Heavy pan ice, and foggy weather was met with from the Button islands, July 15 to Big island, July 16, and up to Eric cove, past the north side of Charles island.

The ship left Eric cove on July 18, and after lying-to during the night off Digges island, was obliged to return to Eric cove on July 19, the fog and ice making it too difficult to proceed.

From Eric cove, which was left on July 20 to July 22, when Port Churchill was reached, the weather was generally overcast and foggy; some light field ice was passed through.

Between Port Churchill and Nelson, thick fog and ice was passed through on July 24 and 25.

Nelson was left on August 10 for James bay, and after proceeding about fifty miles heavy packed field ice was met with, the ship forcing her way through during the day and lying-to at night, until off cape Henrietta Maria on August 16. Here many icebergs were seen aground. From this point heavy ice was encountered, evidently from Fox channel, as it was much discoloured and built up in layers, till August 18 off Bear island, when scattered ice was passed through until the ship anchored off Moose Factory on August 19. On the return trip no ice of any account was met with, as the ship passed inside the Belcher island to avoid it after leaving James bay.

C.G.S. 'ARCTIC.'

During the cruise of the *Arctic* to Hudson bay and strait, icebergs were first seen in latitude $56^{\circ} 46' N.$ and longitude $58^{\circ} 14' W.$, on July 3. Field ice was encountered at the eastern entrance to Belle Isle strait on July 4, the ship having to force her way through ice almost continually; the whole of the distance up the Labrador coast was passed at an average distance of 25 miles, to cape Chidley, which point was reached on July 16. During most of this time fog prevailed. Through Hudson strait pan ice was encountered every day till Charles island was reached on July 25, when open water was found as far as cape Wolstenholme. Engines had to be stopped continually through the strait, but the ice was such that would not have impeded the progress of a full powered steel protected ship. Ice was again met with between cape Wolstenholme and Mansel island. From the latter very little was seen as far as Coates island, reached on July 29. From this point to Marble island, and thence to Port Churchill, reached on August 5, no ice was seen. Between Port Churchill and the Nelson river, loose ice was passed through and extensive ice fields seen to the eastward on August 9. After leaving the Nelson river, ice fields were met within the 17th and 18th August in the middle of Heron bay, but after clearing this no more was seen during the

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1914, while the occupation of icebergs increased along the shore and along in Hudson strait and off the Labrador coast.

SS. 'ADVENTURE.'

Belle Isle was passed at noon on July 22, and at 6 p.m. heavy open ice was encountered. From there to cape Chidley, reached July 28, passed through heavy ice, at times very closely packed together. The track followed passed about sixty miles off Labrador coast. The same condition prevailed through Hudson strait to Digges island, reached on July 31. From Digges to Coates island, very heavy, closely packed ice was encountered, having to butt frequently. From there to Port Harrison, reached August 4, passed through huge sheets of heavy ice, more or less open. Left Port Harrison, August 7, and from there to Bear islands at the entrance to James bay, heavy, rafted, closely packed ice was passed through, having to butt nearly the whole distance. Arrived at Strutton island August 11, and left August 24. Heavy ice was met with from Bear islands to latitude $55^{\circ} 22' N.$ longitude $81^{\circ} 10' W.$, August 25. Very heavy ice was met with north of Belchers. The track followed was west of the Belcher islands, going and returning. No ice of any account was seen after passing Charles island or Hudson strait.

C.G.S. 'STANLEY.'

North Sydney was left on August 5. The first icebergs were sighted in Belle Isle straits on August 8, and thick fog was encountered during two days. Average weather was experienced up the Labrador coast. The track followed was generally in sight of land. Cape Chidley was reached on August 11. On August 13, numerous icebergs were seen off cape Prince of Wales, Hudson strait, and strong winds and snow on the 15th of August off cape Wolstenholme. Fog and heavy ice was encountered when about sixty-miles off cape Tatnam. On the return voyage from Port Nelson, foggy weather was experienced on seven days and snow flurries when off Eclipse harbour on August 30, but no field ice was seen.

SS. 'NASCOPIE.'

Light winds, fog, and numerous icebergs were encountered from Belle isle straits, July 29, to cape Chidley, reached the 9th August, the track followed being along the Labrador coast, calling at several places en route. The same conditions prevailed to Lake Harbour, the first field ice seen being in North bay; Hudson strait, on August 11. From this point to Erik cove, reached the 19th August, westerly winds and some fog prevailed, and many icebergs were sighted. Port Churchill was reached August 25, fine weather being experienced, and no ice seen. From Churchill to Marble island, where the ship arrived on September 3, the weather was overcast and very foggy. From Marble island to York roads, reached September 10, a gale was encountered, otherwise the weather was fine, but overcast.

The *Nascopie* left York roads on September 18 for Charlton island, James bay, and ran into scattered field ice on September 19, which was cleared on the 20th. Fine weather generally was experienced, and Charlton island reached September 23.

On the cruise from Charlton island to Wolstenholme, reached October 6, the weather was usually fine, with the exception of a gale on October 3 and 4. Wolstenholme was left the same day. On the 8th October snow squalls were experienced. During the remainder of the cruise to St. John's, Newfoundland, average weather with a fair proportion of snow squalls was met with, several ports being visited.

C.G.S. 'CHRISSIE C. THOMEY.'

The vessel, after leaving the *Minto* in Hudson bay in latitude $60^{\circ} 50' N.$, longitude $88^{\circ} 55' W.$, on August 5, ran into a field of ice on the evening of the same day.

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and remained more or less hemmed in by ice until September 22, and only reached Charlton island, James bay, on October 1. Off the entrance to James bay the ice was from 90 to 100 feet in thickness.

C.G.S. 'MINTO.'

The *Minto* proceeded north about the end of July, giving the Labrador coast a berth of from ninety to hundred miles, which cleared all field ice; only an occasional berg was seen.

Belle Isle was passed on July 27, and Cape Chidley reached on the 31st.

A field of heavy ice was entered on August 2 in Hudson strait, about thirty miles east of cape Prince of Wales, and the same distance off the south shore. After clearing this, no more ice worthy of note was encountered during the cruise. On August 4, after passing Coates island, extensive ice fields were sighted to the southward, but a northerly course cleared everything.

On November 2, the *Minto* was in a position about twenty-five miles N. by E. from the north end of Mansel island, and there was no ice in sight. This passage is the most critical point in the Hudson bay route, and the above date the latest on record for any steamer to be there.

On the return trip the weather was very fine and clear. No ice was seen in Hudson strait. Cape Chidley was passed on November 6, and Belle Isle reached on the 8th.

METEOROLOGICAL OBSERVATIONS—Taken on Board the U.G.S. "Minto".

DATE	BAROMETER.			THERMOMETER.			WIND.			LOCALITY.		REMARKS.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Direction.	Force.	Clouds.	Lat.	Long.	
July 24	29.75	29.7	29.72				S.W.	3	6	Halifax.	Left Halifax P.M. Evening overcast.	
25	29.95	29.75	29.85	56	54	55	S.	3	5	46 09N.	59 42W.	Some fog.
26	30.15	29.95	30.05	65	46	55.5	S.W.	4	9	49 06N.	57 55W.	Rain P.M.
27	30.15	29.6	29.87	50	43	46.5	N.N.E.	5	9	52 19N.	55 30W.	Rain squalls. Few showers.
28	30.00	29.7	29.85	48	38	43	S.	4	6	(Dominion Run.)		
29	30.30	30.0	30.15	44	39	41.5	S.E.	4	9	53 29N.	56 47W.	Thick fog A.M.
30	30.6	30.3	30.45	44	43	43.5	E.S.E.	3	9	54 25N.	54 40W.	Hazy.
31	30.7	30.6	30.65	39	38	38.5	E.	2	6	57 47N.	58 27W.	
1	30.55	30.56	30.57	42	34	38	S.	2	4	60 28N.	62 25W.	Rain A.M.
2	30.59	30.48	30.49	52	34	43	S.	2	4	60 52N.	60 22W.	Fine and clear.
3	30.45	30.40	30.44	53	32	42.5	E.	2	9	61 46N.	70 18W.	Thick fog at times. Fine and
4	30.40	30.24	30.32	50	38	44	S.W.	3	3	62 28N.	76 25W.	Fine. and fog field
5	30.25	30.20	30.24	52	46	49	S.W.	2	3	61 53	83 35	" Loose fog.
6	30.25	30.27	30.27	67	44	56	S.	2	0	60 24	90 51	"
7	30.34	30.32	30.33	80	56	68	S.	0	0	57 40	92 10	"
8	30.38	30.28	30.33	72	58	65	S.	2	0	57 07	92 25	"
9	30.30	30.28	30.29	80	60	70	S.	4	3	57 07	92 25	" Cloudy in evening.
10	30.40	30.32	30.36				S.E.	3	10	57 35	92 11	Misty.
11	30.30	30.20	30.25	45	38	41.5	E.	5	9	"	"	Rain.
12	30.20	29.9	30.05	42	40	41	E.	5	10	"	"	Moderate gale and wind.
13	30.20	29.75	29.98	41	38	39.5	N.N.W.	8	10	"	"	
14	30.40	30.32	30.36	46	46	46	S.W.	5	10	"	"	
15	30.40	30.28	30.34	48	40	44	S.W.	3	10	"	"	
16	30.40	30.24	30.32	50	38	44	S.W.	3	4	"	"	
17	30.20	30.00	30.10	48	40	44	S.E.	3	9	"	"	Fine. Rain P.M.
18	30.52	30.40	30.46	48	43	45.5	S.E.	3	10	"	"	Thick fog A.M.
19	30.30	30.22	30.26	49	37	43	S.E.	2	3	57 32	92 11	Fine. Rain showers.
20	30.1	29.9	30.0	47	40	43.5	E.	4	10	"	"	Fresh gale and sea, rain
21	30.07	29.74	29.9	37	36	36.5	S.	2	10	"	"	Fog A.M.
22	30.24	30.16	30.2	48	32	40	S.W.	3	10	"	"	Fog banks A.M.
23	30.20	30.12	30.16	60	38	49	S.W.	3	6	"	"	Fine.
24	30.00	29.75	29.97	56	42	49	S.	3	4	57 24	"	

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Date.	Time.	Wind.	Bar.	Therm.	Humid.	Clouds.	Remarks.
"	25	N.W.	46.5	30.02	29.95	30.10	
"	26	W.	43.5	30.11	29.92	30.30	
"	27	N.W.	42.5	30.15	30.00	30.30	
"	28		44.5	30.36	30.32	30.40	
"	29	E.N.E.	39.5	30.37	30.34	30.40	
"	30	S.E.	41.5	29.9	29.7	30.10	
"	31	S.W.	46	29.92	29.9	29.95	
Sept.	1	S.	46.5	29.8	29.76	29.81	
"	2	N.W.	43.9	29.89	29.78	30.00	
"	3	W.	55	30.24	30.10	30.38	
"	4	E.N.E.	48	30.42	30.36	30.48	
"	5	E.S.E.	41	30.42	30.32	30.52	
"	6	S.E.	39.5	29.86	29.72	30.00	
"	7	W.N.W.	43.5	29.92	29.80	30.04	
"	8	W.	45.5	30.20	30.18	30.22	
"	9	S.	43.3	30.25	30.24	30.26	
"	10	N.W.	39	30.31	30.28	30.34	
"	11	W.	44.5	30.175	30.15	30.20	
"	12	N.E.	39	30.075	30.05	30.10	
"	13	N.E.	36	30.33	30.22	30.54	
"	14	N.N.E.	36.5	30.77	30.74	30.80	
"	15	W.	46	30.375	30.35	30.40	
"	16	W.S.W.	40.5	30.13	30.06	20.20	
"	17	N.W.	37.5	29.925	29.85	30.00	
"	18	S.E.	40.5	29.98	29.94	30.02	
"	19	S.E.	41	29.94	29.90	29.98	
"	20	N.N.W.	37	30.42	30.24	30.60	
"	21	E.N.E.	40	30.25	30.00	30.50	
"	22	S.W.	43	29.735	29.60	29.87	
"	23	W.N.W.	33	29.91	29.7	30.12	
"	24	W. x S.	36.5	30.50	30.40	30.60	
"	25	E.N.E.	36.5	30.56	30.52	30.60	
"	26	N.	38.5	30.475	30.45	30.50	
"	27	N.W.	34.5	30.50	30.48	30.52	
"	28	S.W.	36.5	30.55	30.52	30.58	
"	29	S.W.	39	30.33	30.38	30.38	
"	30	E. x N.	32.5	30.35	30.26	30.44	
Oct.	1	E.S.E.	30.5	30.43	30.40	30.46	
"	2	N.E.	29.5	30.30	30.20	30.40	
"	3	N.W.	35	30.10	30.08	30.12	
"	4		31	30.07	30.00	30.14	
"	5		32	30.16	30.00	30.32	
"	6		32	30.10	30.00	30.20	
"	7	W. x N.	27.5	29.94	29.92	29.96	
"	8	N.E.	27	29.65	29.65	29.65	
"	9	N.E.	28	29.615	29.58	29.65	
"	10	S.W.	26	29.69	29.58	29.80	
"	11	W.	26	30.16	30.22	30.10	
"	12	N.W.	24.5	30.17	30.10	30.25	
"	13	E.	32	29.55	29.50	29.60	

METEOROLOGICAL OBSERVATIONS—Taken on Board the C.G.S. "Minto" *Couche Island*

Date.	Barometer.			Thermometer.			Wind.			Loc. & Alt.		Remarks.
	Max.	Min.	Mean.	Max.	Min.	Mean.	Direction.	Force.	Clouds.	Lat.	Long.	
1912.												
Oct. 14.	29.92	29.74	29.83	32	27	29.5	N.E.	5	10	Halifax.		Light snow shower.
15.	30.06	30.00	30.03	26	23	24.5	W.	4	10	"		"
16.	30.04	29.98	30.01	23	21	22	S.	5	10	"		"
17.	29.80	29.55	29.67	24	20	22	W.	4	10	"		"
18.	30.12	29.74	29.93	26	23	24.5	N.W.	3	6	"		"
19.	29.96	29.25	29.6	30	26	28	E.	8	10	"		Heavily gale, but dull sun.
20.	29.68	29.20	29.44	34	28	31	N.E. & E.	8	10	"		Thick snow.
21.	30.32	40.06	30.19	26	24	25	W.	8	10	"		Moderate gale.
22.	30.30	30.12	30.21	28	26	27	E.	2	10	"		"
23.	30.72	30.32	30.52	28	25	26.5	N.W.	3	6	60.25	61.52	Snow A.M.
24.	30.88	30.80	30.84	28	25	26.5	N.W.	4	6	"		"
25.	30.90	30.62	30.76	30	26	28	S.	4	4	"		"
26.	30.44	30.40	30.42	33	29	31	S.E.	6	4	"		"
27.	30.28	30.18	30.23	35	31	33	S.	5	5	"		"
28.	30.20	30.02	30.11	34	30	32	S.	6	6	"		"
29.	30.50	30.18	30.34	32	28	30	W.	3	5	60.35	63.00	"
30.	30.11	29.84	29.98	32	23	28	S.E.	3	10	62.33	76.00	"
31.	30.20	30.00	30.10	31	27	29	W.	3	10	62.30	77.22	"
Nov. 1.	30.17	30.07	30.12	26	20	23	S.E.	3	9	62.30	"	Light snow shower.
2.	30.00	29.90	29.95	24	14	19	S.	3	10	62.48	79.25	"
3.	29.84	29.30	29.57	24	23	23.5	S.	6	10	62.52	74.00	"
4.	29.40	29.35	29.37	28	25	26.5	N.W.	6	10	60.25	61.47	Moderate gale.
5.	29.82	29.60	29.71	28	26	27	W.	6	10	"		"
6.	29.86	29.79	29.82	30	28	29	W. & W.	5	5	60.25	61.00	"
7.	30.04	29.20	29.62	31	27	29	W.	4	5	56.30	56.58	"
8.	30.58	29.70	30.14	49	27	38	(A.M.) W. & N.W.	4	5	54.50	56.02	"
							(P.M.) E. & E.					"
9.	30.05	29.80	29.92	42	38	40	W.	10	6	48.30	59.17	Strong gale.
10.	30.30	30.08	30.19	40	36	38	N.W.	4	9	Cape Cansu, about at 2 p.m.		Occasional rain.
11.	30.45	30.38	30.41	45	34	39.5	N.	3	3	Halifax.		Fine.

SUMMARY OF METEOROLOGICAL OBSERVATIONS TAKEN AT PORT BURWELL.

(Extract from the Moravian Mission Journal.)

DATE.	Mean Barometer.	Mean Thermometer.	Mean daily range of Temperature.	Percentage of Overcast.	NUMBER OF DAYS IN WHICH OCCURRED.				WIND.		
					Fog.	Rain.	Snow.	Aurora.	Mean Force.	Mean Direction.	
1907.											
July.....	29.37	45.86	16.18	51	.....	4	.....	.....	3.8	S.E.
August.....	29.18	44.42	12.66	58	4	5	.....	.....	3.7	S.
September.....	29.15	35.72	7.7	47	1	6	.....	5	4.7	N.W.
October.....	29.04	29.21	7.4	89.2	.....	2	7	.....	5.45	N.W.
November.....	28.88	20.6	9.36	91.9	.....	6	4	.....	5.1	E.
1908.											
July.....	29.11	43.04	13.15	85.6	5	4	1	1	3.3	S.E.	
August.....	29.14	39.24	7.91	66.9	6	5	1	1	2.9	S.E.	
September.....	28.91	38.26	9.3	76	4	6	3	2	4.5	N.W.	
October.....	29.13	29.06	6.2	91	.....	2	3	2	5.5	N.N.W.
November.....	28.87	23.43	2.7	93.4	.....	3	3	.....	5.6	E.N.E.
1909.											
July.....	29.11	41.00	14.2	38.2	17	2	1	.....	2.06	N.E.
August.....	29.07	30.99	11.6	36.3	12	7	1	.....	2	S.
September.....	29.10	38.96	10.6	.....	1	.....	.....	3	2.9	N.W.
October.....	29.20	51.3	5.0	.....	.....	3	10	1	2.2	N.W.
November.....	29.10	24.3	7.05	.....	.....	3	12	1	3.1	N.W.
1910.											
July.....	29.18	43.58	15.3	.....	4	10	.....	.....	2.5	S.E.
August.....	29.16	44.1	13.2	.....	4	.....	.....	1	2.7	E.
September.....	28.99	34.9	7.0	.....	3	9	11	1	3.1	N.N.W.
October.....	29.05	28.3	6.7	.....	1	2	3	.....	2.9	N.
November.....	29.47	24.9	4.1	.....	.....	.....	.....	1	2.8	E.

Date.	NUMBER OF DAYS OF				Of Fine and Clear.	WIND.		Mean Tem- perature.
	Fog.	Rain.	Snow.	Aurora.		Mean Dir.	Mean Force.	
					per. cent.			
1910.								
October.....		1	10		43	N.	4.8	
November..	3		5		50	N.E.	2.6	
December to 15th....	6		1		13	N.W.	5.2	
1911.								
May from 15th...	2		9		13	N.	4	
June to 23rd.....	4	4			43	W.	2.1	
July 19th to 27th ..	5	3			13	N.E.	3.9	
August... ..	3	2			60	N.E.	2	
September..		8	4		13	N.	5.2	
October.....		2	8		30	N.	4	
November.....	1		9		20	S.E.	4.4	
December to 15th..	2		5		40	N.	3.5	
1912.								
May from 15th			9		25	N.	4.7	
June	1	5	12		20	E.	4.1	
July.....	6	5	1		16	E.	3.6	
August... ..	1	3	3		36	E.	4	
September....	1	1	1		33	E.	4	
October....			9		37		4.8	19

ICE CONDITIONS IN HUDSON STRAITS AS OBSERVED FROM ERIC COVE.

(EXTRACTS FROM HUDSON BAY COMPANY'S JOURNAL.)

October, 1910.

- 1st.—Snowstorms. Straits and cove still blocked with very heavy ice. No water in sight.
- 3rd.—Cove still blocked with ice. Cold and clear.
- 4th.—Some ice went out of cove.
- 7th.—Cove blocked again with ice.
- 8th.—Cove cleared of ice but large bergs grounded all along shore.
- 12th.—Cove again blocked with ice, but clear water in straits.
- 14th.—Cove half filled with ice, not much in straits.
- 22nd.—Straits clear of ice.
- 28th.—Cove filled with drift ice.
- Wind (prevailing) N.E. during month.

November, 1910.

- 2nd.—Straits appear to be clear of ice.
- 6th.—Ice sighted about twenty miles off.
- 9th.—No ice in straits.
- 13th.—Thermometer 0.
- 18th.—No ice in sight.
- 22nd.—Very little drift ice in straits. Slab ice in cove.
- 27th.—New ice in bay.
- Winds moderate during month.

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December, 1910.

- 1st.—Bay frozen solid. Straits blocked with drift ice. No water in sight.
 7th.—Ice 6 inches thick in bay. Thermometer —10.
 12th.—Thermometer —30.

March, 1911.

- 14th.—Some water in sight in straits now.
 22nd.—Small hole at mouth of bight, but outside all blocked with ice.

April, 1911.

Rough month.

May, 1911

- 9th.—No water in sight in straits from highest hills.
 20th.—Straits still blocked completely with ice.
 31st.—Straits completely blocked with ice.

June, 1911.

- 10th.—Ice appears to be slacker now in straits.
 11th.—Spots of water to be seen in straits.
 13th.—Straits again blocked.
 22nd.—Ice is getting a little looser in straits.

July, 1911.

- 19th.—Straits and bight packed with ice.
 20th.—Ice still tight on shore.
 21st.—Water showing in straits.
 22nd.—Straits still blocked with ice.
 24th.—Ice a little slacker in straits.
 27th.—Ice appears to be loose in straits.
 29th.—*Beothic* arrived.

August, 1911.

- 7th.—All ice gone from cove.
 10th.—Cove filled with ice again. Straits appear to be blocked.
 12th.—No ice in sight.
 13th.—No ice in sight.
 18th.—Heavy frost.
 19th.—No ice in sight.
 22nd.—*Pelican* arrived.

September, 1911.

Some fierce gales during month.

October, 1911.

- 22nd.—No ice yet around shore.
 24th.—Straits all clear of ice yet.
 Considerable wind and snow during month.

November, 1911.

- 1st.—No shore ice forming yet.
- 5th.—Cold day. Slob making around shore.
- 8th.—Harbour packed full of ice.
- 10th.—Ice again out of harbour.
- 12th.—No ice in sight in straits.
- 17th.—No ice to be seen in straits. A ship could come in here easily.
- 21st.—Cove full of ice.
- 23rd.—Straits pretty clear of ice. Cove full of slob ice.

December, 1911.

- 6th.—No water to be seen in straits now.

March, 1912.

- 1st.—No water to be seen in straits.

April, 1912.

- 2nd.—No water to be seen in straits.
- 13th.—Cold enough for January.
- 30th.—A good many lakes of water in straits.

May, 1912.

- 10th.—Saw a little water in spots in straits.
- 23rd.—No water in sight. Heavy ice in straits.
- 24th.—No ice in straits.
- 25th.—Ice all back again.

June, 1912.

- 3rd.—No water in sight in straits.
- 10th.—No water in sight in straits.
- 12th.—Some water in straits.
- 13th.—Ice in harbour shows signs of breaking.
- 15th.—Quite large patches of water in straits.
- 21st.—Some drift ice in straits.

July, 1912.

- 2nd.—Straits apparently blocked. Ice in harbour completely sound yet.
- 3rd.—Plenty of open water in straits now.
- 4th.—Hard west wind partly clears straits of ice.
- 10th.—All strait ice seems to be loose. Open water in harbour.
- 13th.—No ice in harbour, but some to be seen in straits.
- 15th.—Cove full of drift ice.
- 16th.—Clear of ice.
- 17th.—Ice returns. *Beothic* arrives.
- 18th.—*Beothic* leaves. Ice slack.
- 19th.—*Beothic* returns on account of having met heavy ice around Digges island.
- 20th.—*Beothic* left
- 21st.—Cove full of ice.

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- 22nd.—Cove full of ice.
 23rd.—Drift ice in straits.
 24th.—Still blocked with ice.
 25th.—Heavy drift ice in cove.
 26th.—Still ice in harbour.
 28th.—Ice slack in straits.
 29th.—Ice seems to slack a little.
 30th.—Harbour still full of ice.
 31st.—Drift ice in cove. Ship with two masts goes west.

August, 1912.

- 1st.—*Active* arrives and reports plenty of ice.
 2nd.—*Active* left. Plenty of running ice.
 3rd.—Not much ice.
 7th.—No ice in harbour now.
 22nd.—*Nascopie* arrives.

August was a fine month, one snowstorm about the middle of the month.

September, 1912.

Fine month, with few gales.

October, 1912.

Considerable snow.

- 26th.—No sign of drift ice so far.
 27th.—Considerable drift ice passing to eastward.
 Fine month on whole. Temperature 20-30 F.

April 15, 1912

WM. J. STEWART, Esq.,
 Hydrographer, Dept. of Naval Service,
 Ottawa.

SIR,—Acting under your instructions of the 2nd March, 1912. I organized my party and proceeded to survey Rupert bay to find, if possible, a suitable locality for a railway terminus.

I left Cochrane on the 6th of May for Missinaibi Crossing on the Transcontinental railway, when my party was encamped for a week waiting for the breaking up of the river. This took place on Saturday, the 4th May. On the following Tuesday we left the Missinaibi Crossing en route for Moose Factory, with four canoes and a party of eighteen men, including the surveying officers.

We reached Moose River port, (Revillon Frères Trading Company, Limited) on the 11th May in the afternoon, just twenty-four hours after the first move of the ice in the north channel. The river was still fast opposite to Moose Factory and we had to portage over Moose island to reach the Hudson's Bay Company's post. It was three days later before the Moose river cleared of ice.

I was rather disappointed on my arrival at Moose Factory at learning that further progress was impossible for three weeks or more on account of the ice in Hannah bay, which seldom disappears before the middle of June.

I met, at Moose Factory, Mr. McMillan, C.E., of the Ontario Government railway, who arrived there during the month of March to investigate ice conditions in

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the spring in the lower part of the Moose river. He had taken a few soundings through the ice, and had also a blue print showing the soundings that had been taken during the previous year by Mr. Ells, C.E., now of the Mines Department, Ottawa.

Seeing that several weeks delay was possible, I decided to undertake a survey of the river. As Mr. Ells' plan showed the north channel to be the deepest, I started my work half a mile above Revillon Frères post. I worked downstream as far as the foot of Middleboro island, a distance of five miles, covering the bar between Little Duck and Sandy islands. No coast line has been done on account of the ice being packed on the shore. The stations were observed as carefully as on an ordinary survey, and those of the triangle Boro-Stream-Tide near the northeast end of Middleboro island, have been marked with three foot iron rods driven into the ground to six inches from the surface. If later on it is desired to continue this survey to the outer bar they could easily be found.

The soundings and fixes were taken from a forty-foot schooner, the only boat available for this work, and are very satisfactory.

Whilst at Moose Factory, Mr. McNab, the District Manager of the Hudson's Bay Company, kindly placed at my disposal all the company's old journals. I had Mr. F. R. Mortimer take extracts of what items might be useful and interesting. Some of these journals were for the year 1763, but they were not continuous. A large number of them were destroyed a few years ago, by Dr. Milne, when in charge of James Bay district.

One very important record copied is a table, compiled by Mr. A. Nicholson from records and correspondence, of the names, dates of arrival, and dates of departure of all vessels arriving in James bay between 1751 and 1911 for the Hudson's Bay Company. (Table annexed).

Mr. Y. Draulette, the inspector of the Revillon Frères in James bay, informed me that Halfway point, south of Albany river, is the deepest spot known close in shore on the south and west coasts of James bay, and that this cove was always free of solid ice until late in January.

Learning that both companies at Rupert House were short of provisions, I purchased most of my supplies before leaving Moose river, and on the 10th of June Messrs. Paul Jobin and F. R. Mortimer, with eight men in three canoes left for Mesagonan point, following the shore of Hannah bay. Next day, with the remainder of the party, I left in a small sailboat, but was delayed at the mouth of Moose river for a couple of days by stormy weather.

HANNAH BAY.

On my way to Mesakonan point from Moose Factory I had to go around Hannah bay to avoid the southern limit of the ice field.

It is not possible for me to give a detailed description of this bay, because I passed across it only once, but the following few notes may prove of value.

Soon after crossing the outer bar of Moose river we steered in a southeasterly direction into Hannah bay, situated at the mouth of the West and Harricanaw rivers, and between Nattabisha point on the west and East point on the east.

This bay is very shallow, and mud flats extend from either shore several miles seaward. At low tide the flats extend a couple of miles further, over which but a few feet of water may be carried. The channel between Big Stone point and Mississikabe river is nearly three fathoms deep at low water.

With the exception of a few points, the timber line runs inland from one to three miles from the highwater mark.

As we reached Big Stone point it was almost low water and the beach showed to be a long mud flat, studded with huge boulders. A short distance from the low-water line of the point we could see a flat island composed of drift and of about four to five

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cables in length. It appeared about five to ten feet high, as seen from a distance of a mile, and resembled a ruined cribwork.

From Big Stone point we steered across Hannah bay, anchoring for the night six miles off the mouth of the Mississikabe river, and one mile south of a stony reef that dries one foot at low water. The next morning we proceeded to Mesakonan point.

Ice was always in sight, but was not actually encountered until six o'clock Friday morning, off East point.

Between East point and Mesakonan point there exist a great number of boulder shoals which could be plainly seen by the ice grounding.

DELAYED BY ICE.

When we reached East point on the 14th of June, we had to turn back and take refuge between the mainland and Plover islands. The sailing boat being unable to resist the ice at flood tide, we unloaded and hauled up above high water. In the evening of the 18th of June we made Mesakonan point in canoes, dodging between floating ice and shoals. Next day the sailing boat came in by the same route. We were greatly bothered by ice along the northwest shore of Ministikawatin, when traversing that locality. We were forced to walk to and from the work over a rough muddy and slippery beach in and out of all the numerous coves at high water. The canoes could not be used until the 1st of July, when Messrs. Jobin and Mortimer left for the west shore of Rupert bay.

WORK.

We started the regular survey work from Mesakonan point, the western limit of the survey, on the 19th of June.

As it was impossible under the circumstances to carry on a regular triangulation of the northwest coast of Ministikawatin, I built five large stations and connected them by a checked shore traverse, between stations.

Owing to the nature of the coast, a broken base line (found to be 31,592 feet long) was measured on the mud flats south of Black Bear point. It was worked out by a closed traverse, each distance of which was measured three times by two different observers.

The main triangulation was carried out from Wood island, at the head of Rupert bay, to the foot of the last rapid of the Nottoway river. The angles were measured with a five inch transit.

The coast line was traversed by different methods, according to the importance of the place or the time allotted.

Between Mesakonan point and Sawayan point, the shore was surveyed at the same time as the close traverse between the Ministikawatin stations. Between Black Bear point and South Base station the shore was traversed in conjunction with the base line. The balance of the shore was obtained by using the sextant and ten-foot pole, or by sextant fixes, according to circumstances. In all, we surveyed eighty-five miles of shore.

For several reasons, amongst them a shortage of gasoline, the amount of sounding was not as great as it should have been, but about 183 miles was done. This shortage of gasoline was due to the fact that the bulk of the supply was placed on board the schooner *Chrissie C. Thomey*, which arrived in Hudson bay on the 5th of August, was caught in the ice about the middle of the bay and imprisoned until the 20th of September, and arrived at Charlton island on the 1st of October.

Tidal observations were taken at Rupert House, day and night only whilst there, as no one could be secured to continue the records after we moved to Stag island. Observations were taken at Stag island from the 25th of July till the 3rd of November, but owing to the exposed position and the distance of the gauge from the high-water-line no night records could be obtained.

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Whilst at Moose River post I arranged for tidal records being kept night and day at 20-minute intervals, from the 1st of June until the 25th of October, by the officers of the Revillon Frères post. The working sheet was plotted in November, previous to which date the work was plotted by sections on separate sounding boards.

MINISTIKAWATIN.

The northwest coast of Ministikawatin is very much exposed to the fierce northwest storms of James bay. As may be learned from the plan, the coast line is very jagged, caused by the enormous swells of the bay rolling on the shores. These swells wash the sand and clay away and leave huge boulders showing at low water. At different places these extend several miles further under water, making the entire shore very dangerous for cruising. I had no opportunity to delineate the extent of these shoals, the natives and the local pilots claim that the foul ground off Ministikawatin extends from five to six miles seaward.

MESAKONAN POINT.

Mesakonan point is the western extreme of Ministikawatin and is in the neighbourhood of the boundary line between Ontario and Quebec. It is also the western limit of the season's operations.

The deep water is fairly close to the point, but at present the entire shore is exposed.

About a mile off, in a northeasterly direction, there is a place very suitable for making an artificial harbour and giving ample space for a railway terminus and yards.

A plan on the scale of three inches to one mile has been made of Mesakonan.

REDFERN POINT.

Between Redfern and Cachechu points the coast line makes a small cove with a sandy bottom. This might be made into a very suitable harbour by means of breakwaters from each point and dredging a channel two to three miles long from deep water. Accommodation for about a dozen grain ships of the lake type could easily be made at this place.

COMFORT POINT.

Comfort point is the eastern extreme of Ministikawatin and around it into Cabbage Willows bay, a very good sized harbour could be developed. Soundings show deep water close in shore and four fathoms is given within eight cables of high-water mark.

Enough soundings have been obtained between Wood island and Comfort point to indicate a fairly good channel from Charlton sound to Comfort point.

The land around Comfort point and on Ministikawatin is most suitable for a railway terminus, averaging ten feet above high water, with a light grade inland.

CABBAGE WILLOWS BAY.

Cabbage Willows bay, situated between Comfort point and Black Bear point, extends westerly about ten miles. It is a very shallow bay even at high water, and with the exception of a few pools, at low water it is an extensive mud flat.

At the bottom of the bay there enters a small river, called by the natives Cabbage Willows river, that drains a large swamp lying between the mainland and Ministikawatin.

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It is not possible for me to give any more details about this swamp as I only passed through it once in the winter.

NOTTAWAY RIVER.

The river drains an immense area north of the Laurentian mountains, and empties into the extreme south end of Rupert bay. Its current is very swift and entering the bay it spreads over a considerable width and forms several winding shallow channels.

In the neighbourhood of the Broadback river or north of the last island of the Nottaway river (which I called 'Lemoine island,' after the gentleman exploring the Nottaway valley for the Crown Lands Department), at low water there are five distinct channels across the river. These are divided by islands, or mud and boulder shoals, dry at half tide. None of these channels could float our launch at extreme low water.

The 6th of September being a calm day, with a rising tide, I left Rupert House to follow the main channel of the Nottaway, with the launch and the sailing boat in tow. Taking the main channel off the black buoy, at the entrance to Rupert river, I followed the Nottaway channel as close as possible to the foot of Midbora island, but there I lost all track of the sinuous channel.

I had to continue my survey thence up the river in a dory.

As my time was limited, triangulation was carried only as far as to the first rapids, to connect with the railway company's location line.

The banks of the river on the east side, south of Lemoine island, are steep clay banks from thirty to fifty feet in height, thickly wooded with spruce. At a few places along the shore I noticed recent land slides which are of common occurrence in nearly all the southern rivers of James bay.

The west shore of the Nottaway river, from the first rapid north, is low and marshy land, but thence for a couple of miles it gradually rises from five to twenty feet above high water. The banks are thickly wooded with small black spruce and balsam, whilst only a short distance inland from both shores the land is covered with marshes and muskegs.

Lavoie island is a small, low, muddy and marshy island covered with willows, off the lower end of which extends, in a northerly direction and parallel to the general direction of the channels, a mud and boulder spit for almost two miles.

BROADBACK RIVER.

Broadback river, also known as Little Nottaway river, discharges into Rupert bay from the east along the south end of Midbora island, making its way through the main channel of the Nottaway river.

After looking over the map of the coast line of James bay published by the Quebec Government, and reading the report of Mr. Henry O'Sullivan, to the Honourable Commissioner of Land, Forest and Fisheries of Quebec, 25th May, 1900, one might expect to find a fairly deep natural harbour at the mouth of the Broadback.

While at the entrance to the Broadback river, although no regular soundings were done, I had the opportunity of viewing the harbour from two different camping places. At the time the entire harbour was almost dry at low water, save for a few small channels hardly deep enough to float a loaded dory. Although in some places holes of over ten feet deep were observed they were not large enough to allow a forty-foot launch to swing at anchor.

At the mouth of the river I established a main station on an islet that I called 'Laliberté islet' (named after the surveyor in charge of a survey for the Quebec Forestry Department). This islet may be taken as being the southwest entrance

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point to the Broadback river basin, which extends easterly eight cables to the foot of the first rapids, and about five cables across to the north shore.

The north shore, from Midbora island to the foot of the rapids, is a steep clay bank from fifteen to thirty feet in height, thickly wooded with small black spruce. The south shore is very jagged, all points terminating in solid rock. The average height of the south bank is about eight feet above high water at the timber line.

Laliberté islet is solid rock, rising steeply from the water's edge and having ten feet water close to it. It is about thirty feet in height, with a few scrubby spruce on top.

The south end of Midbora island is solid rock from low water to the timber line, about a distance of 200 yards.

Off the mouth of Broadback river are seven granite rocks, barely covered at high water.

RUPERT RIVER.

Rupert river has been known and navigated by different types of craft since 1668, but mostly by the Hudson's Bay Co., which, in 1670, established its first fur trading post near the mouth to which they have given the name of Rupert House, in honour of their first governor.

From the early time of the post till 1821 very little is known about the movement of the ice or the erosion of the banks of the river, as the company kept no record previous to that date. For the following ninety years nothing is mentioned about any apparent change in the channel of the river, and very little erosion occurred in the river basin, the only visible ones being those produced by small land slides west of the Church of England property.

The south shore of the river from the bay gradually rises to steep clay banks about twenty feet high opposite the Church of England. These run into a flat sandy point where the Hudson's Bay Co. and the Revillon Frères posts are built. Beyond the French post the banks rise steeply from the high water from thirty to sixty feet, continuing past the Rupert House rapids about a mile and a half from the Hudson's Bay Company's wharf.

From the Mission property westward, low water leaves dry salty marshes which gradually widen as they approach the bay. Similar flats extend inland along the south shore from the Revillon Frères post to the foot of the Rupert House rapids. Along this shore is a narrow strip of bank densely wooded with mostly small balsam, but just back of this strip lie swamps and deep muskegs.

The north shore is rather long and marshy, but could easily be drained. The banks vary from five to ten feet in height. There is a fairly high ridge a short distance from the north shore thickly wooded with fair-sized timber, mostly spruce.

The basin between the Hudson's Bay Company's wharf and Rupert House rapid is large enough to accommodate the traffic of James bay for a great number of years and, with proper works, this basin could be made to winter a great number of vessels.

The main nature of the river bed is thick blue clay, with surface boulders at places. No boulders that dry at low water weigh over a ton. The dredged material could be used to reclaim the land over the salt marsh of the north shore.

This basin is so well protected from all wind that there is never any sea to hurt any craft larger than an Indian canoe.

At flood tide the current in the river is still running out and it was at very rare occasions that our launch would swing around at anchor.

Spring tide rises about nine feet in the river. In Rupert bay and river the tide is greatly affected by the wind.

From the company's wharf to almost the inner beacon, there is a fairly good channel of about fourteen feet at low water.

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The channel marked across the bar, by the companies' beacons seems at present to be the deepest, but, at close cross-section sounding at right angles to this channel might disclose a better one.

Between the outside beacon and the black buoy a strong tide sets directly across the channel. We had difficulties last autumn getting into the river with the schooner on account of this cross tide.

No sign of rock could be detected around Rupert river either on the land or at low water. Even Rupert House rapid is only a ridge of boulders between shores, the south side of the rapid being high, steep clay banks and the north side being a long, flat boulder point. This rapid is almost eliminated at spring tide.

The natives informed me that the first sight of solid rock in the Rupert river was at the foot of Smoky Hill rapid, about fifteen miles upstream from the Hudson's Bay Company's post.

PONTIAC RIVER.

Flows into Rupert bay from the east, about five miles north of Poplar point. At its mouth two low islands divide it into three channels. These I called Jolly islands, named after an Indian who has had his hunting ground at the mouth of this river for upwards of thirty years.

Inside of the islands, from bank to bank the river is about $3\frac{1}{2}$ cables in width. No soundings were taken inside them. At low water the river flows over mud flats studded with boulders, and extending seaward about a mile and a half.

No rock was seen nearer than the mouth of the Trout river and Stag rock.

CHARLTON.

Charlton Harbour, on the southeast coast of Charlton island, is nothing more than a small river between that island and Danby island. It is very much exposed to the sweep of the northeast and southeast winds. The tide runs up and down this passage at a velocity reaching at times over five knots.

It is only of recent years that the Hudson's Bay Company has abandoned Moose Factory as their main depot, the chief cause for such a step being the increase in trade which necessitated larger vessels than could enter Moose river. They chose Charlton Harbour as being a more central distributing point for their various trading posts around James bay.

Where the company has its wharf is the only known spot around the island having enough water to allow a steamer to discharge her cargo.

The *Nascopie*, with a draft of 24 feet, last September unloaded her cargo at a pier less than one hundred feet from high-water line.

Until last season the ships were accustomed to enter Charlton Harbour by the southwest passage, passing over a bar of three fathoms at high water, between Charlton island and the southwest point of Danby island.

The tide at Charlton island rises about 5 feet under ordinary conditions.

Last year it was necessary to find another channel to take in the company's new steamer. I was told by Mr. Miller, the Hudson's Bay Company's local pilot at Charlton, that he found a good channel between Carey island and Danby islands, carrying seven fathoms at high water.

From the Hudson's Bay Company's records at Moose Factory between 1751 and 1904, ten ships belonging to or chartered by the company had wintered at Charlton island.

It is barely possible that Charlton Harbour could be made suitable for the wintering of modern grain vessels.

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STRUTTON ISLANDS.

Strutton Harbour is formed by a group of three islands lying twelve miles in a northeasterly direction from Charlton. This harbour has been used since 1904, by the Revillon Frères Trading Co., Ltd., who established their main distributing depot on the largest island.

This harbour affords the best shelter in James bay against storms from any direction, and has a very good entrance from the west between the main and the small Strutton island.

There is a strong tidal current setting from the northeast passage on flood tide that makes this harbour unsafe for wintering ships. In the spring and autumn of the year the bay ice flows in and out of the harbour at every tide.

Two ships, *Eddystone* and *Hallow*, of the Hudson's Bay Company, wintered in this harbour in 1815. I could not find anything in the company's records as to how these ships fared, but they returned to England upon the opening of navigation in 1816.

I had no opportunity of visiting the Strutton islands last summer, but the following information was given me by Mr. Yves Draulette, the district manager of Revillon Frères Trading Co., Ltd.

By closing the northeast gap by a dike, which would not entail a very great expense, because the pass is narrow and not very deep, it would be easy to make the Strutton islands the best wintering harbour in the northern region.

The harbour has an average depth of seven fathoms at low water, tide rising 5 feet. The water is deep close in. The company's steamer unloads her cargo within ten yards of the high-water line.

Strutton islands could be a very convenient place to establish a lighthouse and buoy depot for James bay district.

RUPERT BAY.

Rupert bay is a fairly large body of water at the southeast extreme of James bay, into which empty several important rivers which drain the greatest part of the northern slopes of the Laurentian mountains.

These rivers carry a considerable amount of silt, which in course of time settles mostly south of Stag rock, forming bars, shoals and mud flats, that extend a considerable distance from high-water mark.

The discolouring of the water due to sediment from the rivers, makes it very difficult to detect by sight the presence of shoals or boulders, in the immediate vicinity of the main channel. The tidal currents are so irregular in velocity as well as in direction that they afford but very little help in sounding close to the shallow banks which, as a rule, rise abruptly from the main channel.

The main channel of the bay from Gushue island to a mile beyond Stag island could, at the present time, afford safety for vessels of eighteen to twenty foot draught. From Stag island, vessels of eighteen to twenty foot draught could easily make their way as far as Stag rock, beyond that twelve feet can be carried about eight miles, or to a point about two miles above the entrance to Rupert river. It is only on top of high-water springs that a vessel of ten to eleven feet draught could go in to Rupert river.

We made Rupert river last autumn with the *Chrissie C. Thomey*, drawing eleven and a half feet astern, but this could only be done under special circumstances of favourable wind and tide.

From Gushue island into Charlton sound, three well-defined passages could be used, which, on further examination, would certainly prove very deep channels.

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Inenew passage, named after the local steamer of the Hudson's Bay Company, extends about a mile and a half to the westward of Radisson point on Wood island, and is from four to seven fathoms deep.

Emilia passage, named after the French Company's local steamer, is by far the deepest and shortest route to the east of Charlton island or Strutton harbour. The water in this passage varies from seven to twenty fathoms deep, and passes between Wood island on west and Tent island on the east.

Chrissie Thomey passage, south of Tent island, and passing north of all the small rocky islands off Sherich mount, leads towards Boatswain bay, then turns north along the east side of Tent island. This may prove to be a very deep channel, but at present only a few good casts have been taken when crossing from one island to another.

There is also a passage east of Stag island called Boat passage, on account of the small crafts of the Hudson's Bay Company using it going to and from Charlton island or East Main river. It is fairly deep, but not as deep as the one west of Stag island.

TRACK INTO JAMES BAY.

Entering from Hudson bay, the main track followed by ships of the Hudson's Bay Company passes the westward of the Bear and Twin islands. A few miles south of the Twin islands they shape their course for the beacon at the mouth of the Moose river, thence they make for Charlton island.

The Revillon Frères Trading Co., Ltd., ships take the same route as far south as the Twin islands, then alter course to passing a few miles westward of Trodley island or South Tider island, and thence bear up for the main Strutton island, passing halfway between Charlton island and Trodley island.

This latter track is the better and more practical for reaching Rupert bay, being shorter and deeper.

The Hudson's Bay Company, in London, published a few years ago a navigation chart of James bay, for the use of their own ships. It might prove very useful for us to have a few of those charts at the office. Their charts being of more recent date and on a larger scale would certainly be better than those we have from the Admiralty.

Six good anchorages, close to the main route to James bay, are known: (1st) Off the southeast of the North Twin island, in seven fathoms, close in shore; (2nd) off the south of the South Twin island, also in seven fathoms and close in shore; (3rd) off the east coast of the South Twin island and in five fathoms and a very good harbour; (4th) off the south end of Weston island; (5th) off the south end of Trodely island, or the South Tider island; (6th) Strutton islands. All six anchorages are well protected from the prevailing northwest gales.

ICE CONDITIONS IN JAMES BAY.

Very little information could be obtained regarding the movement of ice in the spring or autumn in James bay, or the southern part of Hudson bay. The officers of both trading companies confine their reports to the conditions existing only a few miles around their own respective posts. The little that is known about the bay is told by the Indians who report at the post from time to time, and this information is confined to a very short distance from the coast and only observed from land or in canoes. In general cases the distance would be limited to five miles off, beyond which practically nothing is known.

In the winter it is known that James bay is practically frozen over, at least the eastern side as far as the Middle islands. At the end of January several natives have been known to go from the east coast to almost every island lying in the middle of the bay.

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By the middle of winter travelling on the ice is good between Charlton island and the Moose Factory in almost a straight line, and also between Charlton island and Rupert House.

The Esquimaux of the Belcher's group have crossed every winter on the ice to trade with the Hudson's Bay Company at Whale river.

I was told by the officials of the French Company that during some winters the natives of the Ottawa island group come over the ice to their establishments at Port Harrison.

The movement of the ice in James bay in the spring of the year is greatly affected by the direction of the wind. Should the prevailing wind be southerly and assisted by the strong current of the rivers emptying into the southern part of the bay, that part would be clear of ice about the second week in June. On the contrary, if the wind keeps northerly the ice will be kept almost stationary at ebb tide. It will run south with the wind and tide until the sun becomes strong enough to melt the ice, or there may be a strong northwest gale which will pile the ice above high-water mark, as was the case this spring in Charlton sound.

On the 27th of June last, in shifting camp from Mesakonon point to Redfern point, we could hardly pass with canoes between the ice flow off Redfern point. During the night a strong gale from the northwest piled all the ice above high water and a few days later it had all melted away. From that date no ice was seen by our party during the season.

Navigation in James bay opens about the 20th of June, when the companies' local steamers leave Moose river for their respective depots.

This year the *Eurelia* left Moose river post on Monday the 24th of June for Strutton harbour, but she had to anchor at Wood island for two days, delayed by ice. Once, while in Strutton harbour, she had to run in and out with the tide as the ice was forcing its way through the northeast passage. It was not until the 3rd of July that they could start building the pier.

The ice met with in Hannah bay and in Charlton sound would not affect to any extent the Newfoundland type of sealing steamers, although some pieces were observed to be from ten to fifteen feet thick. They were all broken up in small pieces, very few of them exceeding a hundred feet in diameter.

In the autumn, the ice that comes down the rivers is all broken up by the last rapids, but soon becomes large and heavy sheets drifting down the estuaries into the bays. After a time these different sheets meet and cement together, making large fields running up and down the bay, influenced by the wind and tide. A drop in temperature for a few days to 30 below zero, accompanied by a strong northerly wind, soon settles this mass of ice fast for the winter. This generally occurs in the latter part of January.

Last spring was the latest recorded season in James bay, the principal causes being the very severe winter and the strong prevailing northerly wind for the first part of the summer.

The following information was gathered during the summer from different parties who had to navigate in and out of the bay.

The Esquimaux from cape Jones reported at Fort George ice at the cape at the beginning of August. The ice was as solid then as it was in January, and no clear water could be seen from the height of land.

The sailing boats from Fort George took three weeks to reach Charlton in August. They had favourable wind, but were delayed by the ice.

Mr. McNab could only make Whale river during the third week of August in the *Inenew* by keeping close to shore, passing between the edge of the ice field and the land.

The *Adventure* came into Strutton harbour last year on the 11th of August for the Revillon Frères Trading Company, Ltd., leaving Montreal on the 18th of July. They

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were fast in the ice for three days in the straits and made Port Harrison on the 5th of August. This last place was cleared of ice on the 3rd of August. Soon after leaving Port Harrison they ran into the ice again and they only got free of it about fifty miles north of Strutton harbour. The *Adventure* was reported to be badly damaged.

The *Beothic* of the Hudson's Bay Steamship Company, came into Charlton on the 21st of August, after a passage of ten days from Port Nelson. This distance was made by the same vessel in two days in the first week of August, 1911.

A great sheet of ice was encountered by the *Beothic* shortly after leaving Port Nelson and it was only south of cape Henrietta Maria that she became free.

I had no opportunity of speaking to the captain of the *Beothic* because, when I arrived at Charlton, the ship was just pulling out. I received the above information from passengers when they arrived at Rupert House.

A sailing-boat of the Hudson's Bay Company from Altawapiskat bound for cape Henrietta Maria had to turn back on the 28th of August, being unable to find a lead in through the ice.

The *Nascopie*, the new steamer of the Hudson's Bay Company, arrived at Charlton on the 22nd of September from Port Nelson. They saw no signs of ice from that last port.

At 7 a.m. on the 5th of August, the surveying schooner *Chrissie C. Thomey* was cast off by the C.G.S. *Minto* in latitude 60-50 N., and longitude 88-55 W., near the middle of Hudson bay. On the same evening she encountered large fields of ice, and on the 9th of August was beset for a fortnight, drifting with the wind and tide.

It was only on the 20th of September that she cleared of ice in eight fathoms of water, between cape Lookout and Trout river. The next day at noon they were in latitude 55-25 N. From there on no more ice was seen. They made Stag island in Rupert bay on the 1st of October, after a trip of 104 days from Halifax.

ICE CONDITIONS IN RUPERT BAY.

The breaking up of the ice in the spring in Rupert bay, as well as in Hannah bay, depends to a large extent on the breaking up of the river. The dates of the break-up, of course, vary each year. In an appendix to this report will be found a table giving the dates of the break-up in the spring in Rupert river, also the dates when the river is fast in the autumn.

Another short table gives a comparison of dates of the breaking up and closing of the Hayes, Moose and Rupert rivers for seventy-six years. I found that the river is clear of ice on the 23rd of May, the earliest date being the 1st of May, 1878, and the latest being the 8th of June, 1838.

The average date of closing in the autumn is the 23rd of November, the earliest date being the 5th of November, in 1832, and in 1873. The latest is the 13th of December, 1852.

It is safe to say that on an average the Rupert river is open six months in the year.

After the rivers are open the length of time that ice floats around Rupert bay depends entirely on the wind.

In the autumn, the ice that is formed in the upper reaches of the rivers comes down into the bay. This runs out at ebb tide, but most of it comes back again at flood under ordinary conditions. If the wind is southerly, practically none comes back; but should the wind be strong from the north it comes in more compact than ever and then a great quantity is piled up in bays and coves, on shoals and mud flats. After a few days there is left only a central channel where large sheets of heavy ice run up and down. When very cold weather sets in, accompanied by a northerly wind, this ice soon sets fast.

As a rule, Rupert bay is crossed over with dog teams about the 10th of December, between Rupert House and Black Bear point.

CLIMATE.

No weather record has been kept in the immediate vicinity of Rupert bay by either of the companies or by the Dominion Government Meteorological Office.

Meteorological records are kept at Moose Factory by the Dominion Government but they give no information as to the climate of Rupert or James bays. These records are kept nearly twenty miles from the shores of James bay. Last spring, whilst engaged sounding at the mouth of the Moose river, quite a marked difference in the temperature between the posts and outside of the river was distinctly noticed.

Last season a record of the temperature, morning and evening, from the 18th of June until the 15th of December, was kept by the survey. A table, giving for every month the maximum and minimum temperatures as well as the monthly average, with a column giving the maximum change in twelve hours, is attached. This sudden change in the temperature is very well marked, particularly as not much change was noticed at Port Nelson, which cannot be called a warm climate in summer time, and when the temperature was very uniform throughout the summer months. Columns in this table also give the direction of the prevailing winds, the number of days of rain or snow and cloudy or fine weather.

The month of July, both at Nelson and in James bay, is by far the best month for survey work. After the first week of September it is hardly worth while trying any more hydrographic work, although sounding was not started last season until the 17th of September.

No heavy gale was recorded last year; but a great deal of strong wind prevented work for a great number of days.

During June and July we had several heavy thunderstorms, and I was told that it is of general occurrence every year, and that the heaviest storms are felt at Albany.

On the whole it does not seem to me, considering the latitude and the proximity of the ice field, that the summers in Rupert bay are very cold. From the Hudson's Bay Company's record we find that every year they are getting fine crops of garden roots and vegetables, and that barley and oats could easily be cultivated at Rupert House.

AGRICULTURE.

In the southern part of James bay there are some very good agricultural prospects. At Albany, Moose Factory, Rupert House and East Main, the Hudson's Bay Company have had, each year, a piece of land under cultivation in the vicinity of their posts, and from which they have always had satisfactory crops.

At Albany the Oblate Fathers have a farm on which they grow and raise vegetables and stock for the needs of the Mission and the hospital.

At Moose Factory, the Church of England Mission raises enough potatoes for the mission and the boarding school, and with the surplus they supply the wants of the Revillon Frères Trading Co., Ltd., at Moose River post.

At Rupert House the French Company have eleven horses that are fed at the present time, in winter, with pressed hay, brought from Montreal by the steamer. In the summer, these horses graze around the post.

A year ago, Mr. Barboteau, the agent of Revillon at Rupert, cleared one hundred acres of land on the north shore of Rupert river, and in a few years he expects to raise enough on that farm to be independent of outside supply.

I obtained last fall at the Hudson's Bay Company's store at Rupert House, potatoes that would bring very good prices on the Montreal market at any season of the year.

All around Hannah and Rupert bays, between high-water mark and the timber line, lies immense flat grazing land. A great number of moose tracks were seen last summer between Cabbage Willows bay and the Shebish river. The wild hay in that locality grows to over three feet in height.

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Almost all vegetable and garden roots that grow in the vicinity of Montreal could be grown at Rupert House, after the land has been cleared and the ground properly drained.

At one time at East Main the Hudson's Bay Company used to keep a cattle ranch to supply fresh meat for the winter to the different posts around the bay.

Barley gave very satisfactory results in the early days of the Hudson's Bay Company, but of late years its growth has been discontinued.

At the present time, the companies cut hay for their cattle in the neighbourhood of their posts on the salt water marshes.

GAME AND FISH.

In spring and autumn the Indians get a considerable amount of Whitefish at the mouth of the rivers discharging into Rupert bay.

The Whitefish caught have a very rich flavour, and are about the size of a large herring. We also caught, at the mouth of the Nottaway river, whitefish weighing over two pounds.

The Indians catch the Whitefish with gill nets. Late in the autumn the natives scoop them up in scoop nets and load a canoe in a few hours. This happens at the foot of Smoky Hill rapids on the Rupert river, about fifteen miles east of Rupert House.

In the spring and autumn, a large number of sea-going trout will rise to the fly. A great many large sturgeon are caught by the natives above the tidal waters of the Nottaway river. Dorés are also caught around Rupert bay. Numerous flocks of various wild birds feed on the mud flats in Rupert bay in the spring and autumn, and some of these are known to breed on the islands and around about Ministikawatin. Wild species of plovers, etc., are hunted by the natives. The most numerous of these birds are the wavies; but from what I have seen, the best white man hunter has very poor show at hunting them.

The woods abound with birch and spruce partridge.

Ptarmigan are plentiful in the early part of the winter, and this year we killed, at Stag island, in less than five weeks, upwards of seven hundred, with less than five dollars' worth of ammunition. These birds are so tame that they can be driven into gill nets hung upon willow bushes.

Rabbits can be found in great numbers anywhere on the mainland or the islands of Rupert bay, and are the only animals that the Indians can rely on for their sustenance.

Until a few years ago, moose were never seen in the district of Rupert House; but since the construction of the National Transcontinental railroad they have migrated toward the north and, consequently, that district between Hannah and Rupert is now well stocked with moose.

MATERIAL FOR CONSTRUCTION.

Timber for piles, false work, ties, camps, and warehouse, etc., could be cut anywhere around Rupert bay or the adjacent rivers, and at a very short distance from any selected place for a harbour. Sand can be obtained at the head of Lemoine island, on the southeast side of Stag island and southeast of Wood island, also between Sawayon and Comfort points.

Gravel is very scarce for any considerable use in construction.

Stones and boulders for breakwater, filling, riprap wall, etc., could be found in large quantities between Sawayon and Redfern points, in fact almost at any points on Ministikawatin.

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Rock could be quarried at the Broadback river, Smoky Hill, and all the small islands at the foot of mount Sherich. The rock is mostly granite and gneiss. There is no sign of limestone anywhere in the vicinity of Rupert bay.

Brick clay can be found almost anywhere in the southern part of the bay.

RETURN JOURNEY.

On the 17th of December, the ice was fast for the first time between the east of Stag island and Burntwood point. The next day we started for Rupert House and arrived that same evening.

We were sixteen in the party, including the guide, and had only sixteen dogs to haul our luggage and provisions for the trip.

We were delayed at Rupert House six days waiting for the return of the agent for the Hudson's Bay Company from Moose Factory.

We left Rupert House on the morning of the 26th of December and made Moose Factory in the afternoon of the 31st of December.

Here we rested for a few days while some repairs were being made to our snowshoes. We left Moose Factory in the morning of the 6th of January, passing by the Abitibi and Frederick House rivers, and arrived at Cochrane in the evening of the 16th of January.

The crew were paid, discharged and sent home on the 20th of January, and on the same day I proceeded to Ottawa.

I am, sir,

Your obedient servant,

H. D. PARIZEAU.

METEOROLOGICAL DATA, RUPERT BAY.

This table is compiled from our own records of observation taken by Mr. F. R. Mortimer during the surveying season of 1912.

SUMMARY of weather conditions in Rupert bay during the season of 1912.

Months.	TEMPERATURE.			Maximum Change in 12 hours.	Prev. wind.	NUMBER OF DAYS.			Remarks.
	Max.	Min.	Aver.			Rain or Snow.	Cloudy.	Fine.	
June.....	78	31	47	38	N. & N.E.	4	5	4	18th to 30th June
July.....	80	38	56	15	W. & N.W.	6	6	19	
August...	65	36	46	18	N. & N.W.	6½	13	11½	
September	56	28	45	14	E. & S.E.	7½	12½	10	
October...	48	20	31	12	N.W. & W.	6½	15½	9	
November	32	3	20	17	S.W. & W.	8	11½	10½	1st to 15th Dec.
December.	22	23	2	.....	S.W.	2½	9	3½

The average temperature for the summer season was 49, with a maximum of 80 and a minimum of 28.

TABLE II.—DATES OF OPENING AND CLOSING OF MOOSE RIVER, 1763-1912.
(Extracts from Hudson's Bay Company's Journals at Moose Factory.)

Years.	River Open.	River Fast.	Years.	River Open.	River Fast.
1763.		Nov. 13.	1856.	May 7.	Nov. 10.
1764.	April 15.	" 23.	1857.	" 23.	" 14.
1765.	" 27.	" 11.	1858.	" 11.	" 24.
1766.	May 15.	" 28.	1859.	" 8.	Oct. 25.
1767.	" 18.	" 29.	1860.	" 8.	Nov. 26.
1768.	" 16.		1861.	" 10.	
1781.		Nov. 10.	1862.		Nov. 2.
1782.	April 19.	" 4.	1863.	May 3.	" 1.
1783.	May 2.	" 9.	1864.	" 2.	
1806.			1867.		Nov. 5.
1807.	May 11.	Dec. 1.	1868.	May 11.	
1808.	" 3.	Oct. 29.	1869.		Oct. 29.
1809.	" 9.	Nov. 7.	1870.	April 24.	Nov. 8.
1810.	April 30.		1871.	May 3.	
1814.		Nov. 25.	1901.	April 29.	Nov. 10.
1815.	May 31.	" 2.	1902.	" 29.	" 16.
1817.	" 25.	Oct. 25.	1903.	May 14.	" 19.
1818.	" 13.	Nov. 30.	1904.	" 6.	" 26.
1819.	" 5.		1905.	" 8.	" 26.
1842.	" 8.	Nov. 17.	1906.	" 4.	" 26.
1850.		Dec. 7.	1907.	" 28.	" 16.
1851.	May 9.	Nov. 6.	1908.	" 15.	" 18.
1852.	" 9.	Dec. 13.	1909.	" 20.	" 18.
1853.	" 14.	Nov. 7.	1910.	April 27.	Dec. 1.
1854.	" 15.	" 4.	1911.	" 29.	Nov. 4.
1855.	" 13.	" 15.	1912.	May 13.	

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TABLE III. DATES OF OPENING AND CLOSING OF RUPERT RIVER, 1822-1912.

(Extract from Hudson's Bay Company's Journals of Rupert House.)

Years.	River Open.	River Fast.	Years.	River Open.	River Fast.
1822		Nov. 19	1870	May 9	Nov. 21
1823	May 28	" 12	1871	" 25	" 23
1824	June 3	" 13	1872	" 23	" 19
1825	May 16	" 18	1873	" 28	" 5
1826	" 22	" 7	1874	June 6	" 14
1827	" 15	Nov. 22	1875	May 31	" 18
1828	" 11	Dec. 6	1876	" 21	Dec. 1
1829	" 24	Nov. 25	1877	" 15	" 8
1830	" 11	Dec. 11	1878	" 1	" 5
1831	" 14	" 1	1879	" 24	Nov. 24
1832	" 26	Nov. 5	1880	" 31	" 19
1833	" 19	" 25	1881	" 21	" 19
1834	" 21	" 13	1882	" 28	" 16
1835	" 28	" 22	1883	June 2	" 15
1836	June 12	" 29	1884	May 25	" 21
1837	May 31	" 23	1885	" 25	Dec. 6
1838	June 8		1886	" 10	Nov. 18
1839		Nov. 26	1887	" 20	" 2
1840	May 23	" 30	1888	" 22	" 15
1841	" 27		1889	" 10	" 27
1842			1890	June 3	" 9
1843	May 21	Nov. 14	1891	May 25	" 25
1844		" 26	1892	" 25	Dec. 17
1845	May 23	" 24	1893		Nov. 20
1846	" 2	Dec. 5	1894		" 19
1847	" 30	Nov. 14	1895		" 19
1848	" 31	Dec. 2	1896		" 19
1849	" 30	" 1	1897		" 18
1850	" 27	" 7	1898		" 26
1851	" 19	Nov. 11	1899		Dec. 4
1852	" 19	Dec. 13	1900	May 22	Nov. 16
1853	" 30	Nov. 7	1901	" 2	" 22
1854	" 23	" 21	1902	" 7	" 30
1855	" 27	" 29	1903	" 26	" 26
1856	" 17	" 17	1904	" 20	" 21
1857	" 31		1905	" 18	" 13
1858			1906	" 22	Dec. 2
1859		Nov. 6	1907	June 9	Nov. 17
1860	May 17	" 26	1908	May 24	" 18
1861	" 25	Dec. 12	1909	" 23	" 23
1862	" 13	Nov. 13	1910	" 10	Dec. 2
1863	" 21	" 10	1911	" 12	Nov. 14
1864	" 17		1912	" 28	
1865	" 20	Dec. 7			
1866	" 31	Nov. 30			
1867	" 30	" 18			
1868	" 24	" 14			
1869	" 25	" 23			

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TABLE IV.—DATES OF OPENING AND CLOSING OF HAYS, MOOSE AND RUPERT RIVERS, 1900-1912.

Year.	RIVER CLEAR OF ICE.			RIVER FAST WITH ICE.		
	Hays.	Moose.	Rupert.	Hays.	Moose.	Rupert.
1900.....	May 17.....	29.....	May 22.....	Nov. 12.....		Nov. 16.
1901.....	May 8.....	Apr. 29.....	May 2.....	Nov. 5.....	Nov. 10.....	Nov. 22.
1902.....	May 26.....	Apr. 29.....	May 7.....	Nov. 9.....	Nov. 16.....	Nov. 30.
1903.....	May 30.....	May 14....	May 26.....	Nov. 18.....	Nov. 19.....	Nov. 26.
1904.....	May 13.....	May 6.....	May 20.....	Nov. 27.....	Nov. 26.....	Nov. 21.
1905.....	May 2.....	May 8.....	May 18.....		Nov. 25....	Nov. 13.
1906.....	May 27.....	May 4.....	May 22.....	Nov. 19.....	Nov. 26.....	Nov. 17.
1907.....	June 7.....	May 28.....	June 9.....	Nov. 19.....	Nov. 16.....	Nov. 17.
1908.....	May 24.....	May 15.....	May 24.....	Nov. 24....	Nov. 18....	Nov. 18.
1909.....	May 27.....	May 20.....	May 23.....	Nov. 15.....	Nov. 18....	Nov. 23.
1910.....	May 23.....	Apr. 27.....	May 10.....	Dec. 7.....	Dec. 1....	Dec. 2.
1911.....		Apr. 29.....	May 12.....		May 4.....	Nov. 14.
1912.....		May 13.....	May 28.....			

TABLE V—AGRICULTURAL CONDITIONS AT RUPERT HOUSE

(Extract from Hudson's Bay Company's Journals of Rupert House.)

Year.	Potatoes.				Other seeds sown : Peas, turnips, radishes, cabbages, beans, onions, carrots and pumpkins.	Vegetables. Gathered.
	Sown.		Dug.			
	Date.	No. bush.	Date.	No. bush.		
1822.	June 1		Oct. 4		June 22.	Oct. 4.
1823.	May 20		" 4	54		
1824.	" 20		" 6	74	July 5.	
1825.	" 18		Sept. 30		June 23.	
1826.	" 18		" 23	200		
1827.	" 15		" 29	120		
1828.	" 15		" 30	285	June 18, barley May 20.	
1829.	" 22		Oct. 7	232	Barley May 24	Barley, Nov. 6.
1830.	" 19		Sept. 27			" Oct. 6.
1831.	" 23		" 28			
1832.	" 17		" 28	378		
1833.	" 14		" 28			
1834.	" 23		" 8			
1835.	" 25		" 22			
1836.	" 25		" 29			
1837.	" 23		" 23			
1838.	" 22					
1839.			" 30	300		
1840.	" 25		" 15	330		
1843.	" 22	20	Oct. 5	224		
1844.	June 3		" 2	178		
1845.	9	9	" 1			
1846.	1	1	" 1	146		
1847.	" 7		" 4	163		
1848.	" 5		" 2	227		
1849.	" 4		" 2	166		
1850.	May 29		Sept. 30	245	May 22.	
1851.	" 27		Oct. 1	232	" 19.	
1852.			" 1	130		Turnips, Oct. 12, 14 bush
1853.			" 7	234	June 3.	
1854.	" 29		" 7	230	May 20.	" " 12, 40 "
1855.	June 7		" 8	166	" 30.	
1856.	May 28		" 4			Barley, Sept. 8.
1859.			" 13	258		
1860.	" 21		" 3	324	May 19.	" " 12.
1861.	" 27		" 7			" " 18.
1862.	" 28		" 13		Barley May 21.	" " 19.
1863.	" 28		" 8	234	May 29.	
1864.	" 20		" 4	264	" 17 and 20.	" " 13.
1865.	" 30		" 8	214	" 22.	" " 11.
1866.	" 30		" 3	96		" Oct. 1.
1867.	" 30		Sept. 30	381		" Sept. 5.
1868.	" 26		Oct. 2	246		" Aug. 28.
1869.	June 14	24	" 1	261		" Sept. 30.
						Turnips, Oct. 18.
1870.	May 18	24½	Sept. 28	154		Barley, Aug. 26.
1871.	June 2	27	" 29	239	Barley June 9.	" Sept. 23.
						Carrots, turnips, beets, onions, Oct. 13.
1872.	" 3	30	Oct. 3	411	" " 3.	
1873.	" 2		" 3			Barley, Sept. 15.
1874.	" 8	10½	" 14	380	June 11.	" Oct. 5.
						Turnips—6 bush.
1875.	" 5	38	Sept. 29		Barley June 5.	
1876.	" 6		Oct. 5	209		
1877.	May 30	33	Sept. 22	235		
1878.	" 30	48	" 19		" May 22.	
1879.	" 29	48	" 22	249	" " 29.	

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TABLE V—AGRICULTURAL CONDITIONS AT RUPERT HOUSE.

(Extract from Hudson's Bay Company's Journals of Rupert House)

Year.	Potatoes.				Other seeds sown : Peas, turnips, radishes, cabbages, beans, onions, carrots and pumpkins.	Vegetables. Gathered.
	Sown.		Dug.			
	Date.	No. bush.	Date.	No. bush.		
1880..	June 4....	.....	Sept. 28....	220	Barley June 9.	Barley, turnips, 15 bush., Sept. 28.
1881..	May 27....	19	" 29....	275	" May 25.	Turnips, 5½ bush.
					Turnips " 30.	Beets, 7 bush., carrots, 5 bush., Oct. 6.
1882..	June 3...	19	" 25....	229	Barley June 7.	Turnips, 45 bush, onions, 8 b., carrots, 8 b., beets, 2 b., parsnips, 2 b., Sept. 25.
1883..	" 6....	19	" 29....	176		
1884..	" 7....	.....	" 29....	259		
1885..	" 4....	.....	" 23....	189		
1886..	.....	.....	" 23....	344		
1887..	.....	.....	" 14....	323		
1888..	May 26 ...	.....	" 19....	229	.....	Onions, 2 b., turnips, 6 b. Sept. 19.
1889..	" 21....	.....	" 23....	266		
1890..	June 11....	.....	" 23....	360	Small seeds—June 6.. ...	Turnips, Oct. 29.
1891..	" 8....	.....	Oct. 8....	178		
1892..	" 1....	.....	Sept. 24....	330		
1893..	.....	.....	" 28....	270		
1899..	.....	.....	" 27....	213		
1900..	June 5....	22	" 27 ...	140	" " 5.	Onions, 3 b., carrots, 8 b., beets, 3 b., parsnips, 3 b., turnips, 15 b., Oct. 2.
1901..	May 28....	20	" 27....	316		
1902..	June 10....	.....	Oct. 6....	96		
1903..	" 12....	.....	Sept. 28 ...	216		
1904..	" 6....	.....	Oct. 5 ...	126		
1905..	" 7....	.....	Sept. 20.			
1906..	" 12....	.....	Oct. 1....	193	Vegetables—June 12.	
1907..	" 14....	.....	" 8 ...	151	.....	Carrots, 6 b., beets, Oct. 3
1908..	.....	.....	" 6....	209		
1909..	June 8....	.....	Sept. 9....	55		
1910..	" 10....	.....	Oct. 3....	145		
1911..	" 13....	.....	" 3....	196	Small seeds—June 10.	
1912..	" 7....	.....			

NOTE.—Grass is brought from the marsh in boats and dried for hay in July and August.

TABLE VI.—Dates of Arrival and Departure of Ships to James Bay from 1751 to 1911.

(This table was compiled from the Hudson's Bay Company's Journals and other records by Mr. A. Nicholson, an Officer of the Hudson's Bay Co., in James Bay for 32 years.)

Year.	Port.	DATE OF ARRIVAL.		Master.	Name of Ship.	Departure.	Remarks.
		Outside.	Inside.				
1751....	Moose	Aug. 3....	John Fowler.	Sea Horse.....	August 10.	Captain's name and ship not recorded.
1752....	Albany	" 4....	.....	Joseph Spurrell	King George.....	" 21.
1753....	"	" 27....	.....	.....	.....	September 10.
1754....	Moose	Sept. 2....	.....	Joseph Spurrell	King George.....	" 15.
1755....	"	Aug. 27....	John Fowler.	Sea Horse.....	" 7.	Ship's name and departure not recorded. Ship's name not recorded for Albany, Moose home packet sent overland at Albany.
1756....	Albany	" 31....	.....	Joseph Spurrell	"	" 21.
1757....	"	" 11....	.....	Joseph Norton.	.....	.....
1759....	"	" 14....	.....	"	.....	September 11.
1764....	"	" 14....	Joseph Homer.	Prince Rupert.....	August 26.	Ship's name and date of arrival not recorded.
1765....	Moose.	Sept. ....	.....	"	Sea Horse.....	September 8.
1766....	Albany	Aug. 14....	.....	"	"	August 31.
1767....	"	Sept. 3....	.....	"	"	September 22.
1768....	"	Aug. 19....	"	"	" 5.	Date of arrival not recorded.
1769....	"	" 17....	.....	"	"	" 5.
1770....	"	.....	.....	William Christopher	.....	" 10.
1771....	Moose	Aug. 24....	Aug. 24....	John Richards.	Prince Rupert.....	" 13.	
1779....	"	"	"	" 22.	Ship's name not recorded.
1780....	"	.....	Sept. 4....	"	"	" 27.
1781....	"	.....	Aug. 27....	"	King George.....	" 20.
1782....	"	Aug. 24....	.....	"	Sea Horse.....	" 20.
1783....	"	Sept. 19....	"	"	October 2.	Ship's name not recorded.
1784....	"	" 3....	.....	William Christopher	.....	September 20.
1785....	"	.....	Sept. 8....	"	King George.....	" 22.
1786....	"	Aug. 16....	.....	John Richards.	Sea Horse.....	" 5.
1786....	"	John Tunshall.	Prince Rupert.....	" 5.	Beaver for E. Main.
1787....	"	.....	Aug. 26....	William Christopher	King George.....	" 9.
1788....	"	Aug. 16....	.....	William Tunshall.	Sea Horse.....	" 8.
1788....	"	.....	.....	John Richards.	Sloop Beaver.....	" 8.
1789....	"	" 16....	"	Sea Horse.....	" 14.	Q. Charlotte from E. Main.
1790....	"	.....	Aug. 27....	"	King George.....	" 21.
1790....	"	.....	Sept. 10....	John Turner.	Queen Charlotte.....	" 21.
1791....	"	.....	" 4....	John Richards.	King George.....	" 30.
1792....	"	Aug. 27....	"	"	" 17.	Nimble Brig from E. Main.
1792....	"	.....	Sept. 12....	John Turner	Queen Charlotte.....	" 17.
1793....	"	.....	Aug. 24....	John Richards.	King George.....	" 20.
1793....	"	Sept. 9....	Williamson.	Nimble Brig.....	" 20.	
1794....	"	Aug. 19....	John Richards	King George.....	" 12.	

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1794	Moose				1	Sept.	John Turner	Queen Charlotte	September 12.	Q. Charlotte from E. Main.
1795	"				29	Aug.	H. Hanwell	Prince of Wales.	" 26.	
1796	"				20	"	"	"	" 23.	
1797	"				28	"	"	"	" 22.	
1798	"				6	Sept.	"	"	" 30.	
1799	"				30	Aug.	"	"	October 1.	
1800	"				9	Sept.	John Richards	King George.	" 8.	
1801	"				23	Aug.	J. Turner	Prince of Wales.	September 14.	
1802	"				18	"	H. Hanwell	"	" 8.	
1803	"				18	"	"	"	" 16.	
1804	"				6	"	"	"	" 21.	
1805	"				17	"	"	"	" 14.	
1806	"				17	"	"	"	" 13.	
1807	"				5	Sept.	John Turner	King George.	" 25.	
1808	"				14	Aug.	H. Hanwell	Prince of Wales.	" 21.	
1809	"	Aug. 31					"	"	" 23.	
1810	"	" 10					"	"	" 23.	
1811	"	Sept. 25					"	"	October 10.	
1812	"	Aug. 26					Thomas Ramsay	Eddystone.	September 26.	Date of departure not recorded.
1813	"	Sept. 4					"	"	September 26.	
1814	"	" 3					John Turner	"	" 20.	Desisted from attempts to proceed to Europe Oct. 10 and arrived at Strutton Oct. 20.
1815	"	"			23	Aug.	"	"	" 23.	
1815	"	Sept. 14					John Davidson	Hadlow	" 28.	Returned in company with Prince of Wales, Capt. Hanwell and wintered at Charlton, date of departure not recorded.
1816	"				22	Sept.	B. Bell	Emerald	October	ate of departure not recorded.
1817	"				26	Aug.	John Davidson	Eddystone	September 14.	
1818	"				16	"	B. Bell	"		
1819	"	Aug. 29								Dates of arrival only recorded.
1820	"	" 5								
1821	"	" 26								
1822	"	" 13								
1823	"	" 29								
1824	"	" 15								
1825	"									
1826	"				16	Aug.	B. Bell	Camden	September 17.	Packet on board on 11th, guns heard on 15th Aug.
1827	"	Aug. 11			30	"	"	"	" 9.	Packet on board on the 9th.
1828	"	" 27					B. Bell	Prince Rupert	September 8.	Packet on board on the 7th.
1829	"	" 27					H. Hanwell	Prince of Wales.	" 17.	" " 14th.
1830	"	" 28					"	"	" 16.	" " 16th.
1831	"	" 3					"	"	28	Arrival from Charlton Aug. 3.
1832	"	" 27					B. Bell	Prince Rupert	" 7.	
1833	"	" 24					H. Hanwell	Prince of Wales.	" 25	Packet on board 21st, ship returned on 23rd Oct. and proceeded to Charlton.
1834	"	Sept. 6					"	"	" 20	Arrived from Charlton July 25.
1834	"	Aug. 25				July	Henry Baker	"	" 24	" at South River August 27.
	"						R. Royal	Gannymede	September 8.	

TABLE IV.—Dates of Arrival and Departure of Ships to James Bay from 1751 to 1911—*Continued.*

(This table was compiled from the Hudson's Bay Company's Journals and other records by Mr. A. Nicholson, an Officer of the Hudson Bay Co. in James Bay for 32 years.)

Year.	Port.	DATE OF ARRIVAL.		Master.	Name of Ship.	Departure.	Remarks.
		Outside.	Inside.				
1835	Moose	Aug. 17	Sept. 2	R. Royal	Prince of Wales	September 7	Packet on board on 3rd.
1836	"	Sept. 1	Aug. 29	H. Baker	"	18	" " on 14th.
1837	"			"	"	12	" " on 10th.
1838	"			R. Royal	"	19	" " on 18th.
1839	"	Aug. 21	Aug. 22	"	"	7	" " on 3rd.
1840	"	" 12	" 12	"	"	August 31	" " on 29th.
1841	"	" 27	" 30	"	"	September 11	" " on 25th.
1842	"			"	Prince Albert	11	
1843	"			"	"	October 3	
1844	"		Sept. 24	"	"	September 10	
1845	"		Aug. 28	"	"	24	Passengers landed on 8th.
1846	"		Sept. 6	"	"	August 31	Packet closed on August 28.
1847	"	" 9	Aug. 10	"	"	September 9	" " on September 8.
1848	"	" 24	" 26	"	"	August 30	" " on August 29.
1849	"	" 16	" 13	"	"	September 8	" " on September 7.
1850	"	" 16	" 19	"	"	6	" " on " 5.
1851	"	" 24	" 25	"	"	10	" " on " 8.
1852	"	" 15	" 18	"	"	5	" " on " 3.
1853	"	" 22	" 26	"	"	17	" " on " 14.
1854	"	Sept. 3	Sept. 4	"	Prince Arthur	21	" " on " 19.
1855	"	Aug. 23	Aug. 28	"	"	22	" " on " 21.
1856	"	" 16	" 17	"	"	7	" " on " 5.
1857	"	" 15	" 17	R. Wishart	"	7	" " on " 5.
1858	"	" 18	" 21	"	"	8	" " on " 4.
1859	"	Sept. 1	Sept. 2	T. Wishart	"	15	" " on August 13.
1860	"	Aug. 22	Aug. 23	D. Wishart	"	9	" " on " 17.
1861	"	" 31	Sept. 1	"	"	18	" " on " 13.
1862	"	" 28	Aug. 31	"	"	18	" " on " 16.
1863	"	" 28	Sept. 1	J. Smythe	"	26	" " on " 19.
1864	"		Oct. 7	J. Taylor	Schnr. Martn		Prince Arthur lost on the island of Mansfield on the night of the Aug. 13th, 1864, 116 pieces saved.
1865	"	Sept. 13		J. James	Lady Head	September 28	
1866	"	Aug. 25		"	"	22	
1867	"	" 15	Aug. 17	"	"	18	
1868	"	" 27	" 29	"	"	14	
1869	"	Sept. 7		"	"	25	

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1870.	Moose.	Aug. 23.	J. James.	Lady Head.	September 11.	Packet sent on board September 9.
1871.	"	" 27.	"	"	" 15.	" " " 12.
1872.	"	" 20.	"	"	" 9.	" " " 6.
1873.	"	" 21.	G. Galbraith	"	" 20.	" " " 16.
	"	" 23 (off after buoys).	"	"	" 28.	For Charlton Island.
1874.	"	"	"	"	" 10.	Left for England, H. Bishop in command.
1874	"	Aug. 21.	H. Bishop.	Ocean Nymph.	" 12.	G. B. Galbraith in command.
1875.	"	Sept. 10.	"	Lady Head.	" 26.	Packet on board September 24.
1876.	"	Aug. 30.	"	Prince of Wales.	" 20.	" " " 17.
1877.	"	" 19.	"	"	September 4.	Departure not recorded.
1878.	"	" 12.	"	"	" 8.	Packet on board September 3.
1879.	"	" 17.	"	"	" 10.	Packet on board September 10.
1880.	"	" 23.	"	"	" 7.	" " " 6.
1881.	"	" 13.	"	"	" 13.	" " " 6.
1882.	"	" 15.	"	"	" 7.	" " " October 5.
1883.	"	Sept. 21.	"	"	" 4.	Returned on October 28, and proceeded to Charlton Island.
1884.	"	" 21.	"	"	"	
1885.	"	"	"	"	July 31.	
	"	Sept. 4.	W. Bayfield	Princess Royal.	October 2.	Broke her cables and became total wreck on Oct. 4th. Crew all wintered at Moose.
1886.	"	Aug. 20.	H. Bishop.	Lady Head.	September 14.	Packet on board September 14.
1887.	"	" 24.	"	"	" 14.	" " " 14.
1888.	"	" 19.	"	"	" 12.	" " " 10.
1889.	"	" 21.	"	"	" 24.	" " " 16.
1890.	"	" 27.	"	"	" 24.	" " " 18.
1891.	"	"	H. Bayfield.	Prince Rupert.	" 1.	York Factory Ship, from Charlton.
	"	July 12. (from Charlton)				
1892.	"	Aug. 23.	J. Ford.	Lady Head.	" 25.	Packet on board Sept. 19.
1893.	"	" 17.	"	"	" 12.	" " " 10.
1894.	"	" 21.	"	"	" 11.	" " " 9.
1895.	"	" 9.	"	"	" 4.	" " " 1.
1896.	"	" 19.	"	"	" 6.	" " " 6.
1897.	"	" 11.	"	"	" 2.	Aug. 31.
1898.	"	" 10.	"	"	" 12.	Sept. 7.
1899.	"	" 18.	"	"	" 12.	" " " 9.
1900.	"	" 22.	"	"	" 23.	" " " 19.
	"	Sept. 3.	"	"	August 30.	Aug. 30.
	"	Aug. 10.	A. Gulland.	Perseverance (chartered)	September 7.	Sept. 5.
1901.	"	" 17.	P. Jensen	Hans	" 11.	" " " 9.
	"	" 17.	J. Ford.	Lady Head.	" 13.	" " " 12.
1902.	Charlton.	Sept. 3.	"	"	" 22.	Commenced unloading on 8th, finished on 17th.

TABLE VI.—Dates of Arrival and Departure of Ships to James Bay from 1751 to 1911—*Concluded.*

(This table was compiled from the Hudson's Bay Company's journals and other records by Mr. A. Nicholson, an officer of the Hudson's Bay Co., in James Bay for 32 years.)

Year.	Port.	DATE OF ARRIVAL.		Master.	Name of Ship.	Departure.	Remarks.
		Outside.	Inside.				
1903.	Moose.	Aug. 16.	Aug. 17.	J. Ford.	Lady Head.	Sept. 14.	Wrecked on the Gasket Shoal Sept. 17th. Crew and passengers saved.
1904.	"	Sept. 11.	Sept. 11.	A. Gulland.	Inenew.	"	Returned to Charlton Oct. 27th. Wintered there.
	"	Aug. 30.	Aug. 31.	J. Ford.	Stork.	19.	
1905.	"	"	"	A. Gray.	"	Aug. 9.	Towed out by Inenew.
1906.	"	"	"	J. Ford.	Discovery.	Sept. 8.	Packet on board on Sept. 7th.
	"	"	"	N. Freakley.	"	Aug. 23.	"
1907.	"	"	"	J. Ford.	Stork.	Sept. 15.	"
	"	"	"	N. Freakley.	Discovery.	Aug. 27.	808 tons general cargo.
1908.	"	"	"	N. Freakley.	Stork.	Sept. 5.	123 tons coal and 559 tons general cargo.
	"	"	"	J. Ford.	Discovery.	3.	745 tons general cargo.
	"	"	Sept.	N. Freakley.	Stork.	Oct. 2.	Ready for sea on Sept. 26th, but delayed by bad weather. Turned back from the Bears and got wrecked on Liston Rock, Oct. 10th, 1908. Total wreck.
1909.	"	"	Aug. 12.	J. Ford.	Discovery.	Aug. 25.	752 tons general cargo, discharged in 4½ days.
1910.	"	"	"	"	"	"	Ready to start on 23rd, delayed by fog.
	"	"	"	A. Anderson.	Sorine.	Sept. 15.	Sailed out by east channel, returned to Charlton Oct. 3rd, leaking.
1911.	"	"	"	E. Falk.	Beothic.	Aug. 22.	Both ships went to York factory before coming here.
	"	"	"	J. Ford.	Discovery.	Sept. 13.	

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DEPARTMENT OF THE NAVAL SERVICE,
HYDROGRAPHIC SURVEY,

OTTAWA, May 16, 1913.

The Chief Hydrographer,
Department of the Naval Service,
Ottawa.

SIR,—I beg to submit the following report upon the work in connection with the automatic gauges upon the Great Lakes and St. Lawrence river for the fiscal year 1912-13.

Automatic gauges were installed upon the Great Lakes by the Department of Public Works for the first time in 1906, in connection with the survey for the Georgian Bay and Ottawa River Ship canal. This survey being completed, they were transferred to the Department of the Naval Service in May, 1912, and attached to the Hydrographic Survey.

All the gauges in use by this Survey are of the Haskell type, similar to those used by the United States Lake Survey.

The original installation was for the purpose of obtaining bench-marks at various points on the lakes by water transfers from near-by gauges on the United States shores of the same lakes.

For example: Elevations of bench-marks at Toronto, Kingston, Brighton and Port Dalhousie have been obtained by comparison with simultaneous gauge readings at Tibbet's Point, N.Y.

Elevations of bench-marks at Port Colborne and Port Stanley have been derived from simultaneous readings of gauges at Cleveland, O., and Buffalo, N.Y.

Elevations of bench-marks at Goderich have been derived from readings at Harbour Beach, Mich., and Mackinac City, Mich.

Elevations of bench-marks at Collingwood and French river have also been derived from simultaneous readings at Harbour Beach, Mich., and Mackinac City, Mich., and at Port Arthur, Ont., from simultaneous readings at Marquette, Mich.

These elevations having been obtained, the gauges are maintained for the purpose of furnishing a complete record of the oscillations of the levels of the Great Lakes, for the study of various hydraulic problems therewith.

So far, it has been possible to keep them in operation only during the season of navigation, but trials are now being made with various devices to overcome the effects of heavy frost and ice, and it is hoped that before long yearly records at all the important gauges will be obtained.

During the past season the following nine gauges were in operation on the Great Lakes: At Port Arthur, Sault Ste. Marie (upper entrance to canal), at Sault Ste. Marie (lower entrance to canal), at Goderich, at Isle aux Pêches, Detroit river, at Fighting island, Detroit river, at Port Colborne, at Port Dalhousie, and at Kingston.

To assist the Department of Public Works in its investigation into the effect of withdrawals of water upon the level of the St. Lawrence river below Montreal, three gauges were installed, viz., at Longue Point, Sorel, and Three Rivers.

As the data for these gauges become referenced to the geodetic levelling, the records are being reduced to the common datum (mean sea-level) and tabulated for future use.

This important work is being conducted by the undersigned, assisted by Mr. Charles Price, who have to install the gauges and visit and inspect them from time

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to time, as they are very delicate, and require constant attention if reliable records are to be obtained.

The records are placed upon continuous rolls of paper attached to the gauges, which give a month's service and are renewed thus often. These hydrographs have to be scaled off in the office upon receipt, and the readings tabulated.

In addition to these new records, many valuable water-level readings had been obtained at the various locks of the Dominion canals since their construction, by reading staff gauges. As all these are simply the depths over the lock sills, it is intended to reduce them to the common datum of mean sea-level.

Attached is a table showing the elevation of the various bench-marks on the Great Lakes as derived by water transfers from similar self-recording gauges on the United States shores of the lower lakes.

I am, sir,

Your obedient servant,

F. R. BURGESS,

Officer-in-Charge, Automatic Gauges.

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DESCRIPTIONS OF BENCH-MARKS ESTABLISHED BY AUTOMATIC GAUGES.

LAKE SUPERIOR.

Location.	Description.	Mean Elevation.
Port Arthur, Ont.	<i>Port Arthur B.M.</i> , is top of a steel rivet driven vertically into foundation stone, first course above ground, situated at S. W. corner of C. P. Ry. Freight Office on Arthur Street. Transfer 1907-12 Inc.....	616·141

LAKE HURON.

Goderich, Ont....	<i>Goderich B.M.</i> is top of steel rivet set vertically in cement foundation S. E. corner of chimney of Goderich Water Works Pump-house; South side Goderich Harbour. Transfer 1910-12 Inc.....	588·568
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GEORGIAN BAY.

Collingwood, Ont..	<i>Collingwood B.M.</i> No. 66 $\frac{1}{2}$ is top of a steel rivet driven vertically into top of plinth course N.W. corner of Collingwood Ship Building Co.'s Pumphouse. Transfer 1906-11 Inc.....	587·851
French River, Ont	<i>French River B.M.</i> No. 26 is on top of iron ring-bolt set in solid rock about 250 feet S.W. of Ontario Lumber Company's Dock. Transfer 1906-07 Inc.....	591·585

LAKE ERIE.

Port Colborne, Ont	<i>Port Colborne B.M.</i> is top of steel plug set vertically in coping of North side of West abutment of Swing Bridge over South entrance walls to Guard Lock of Welland Canal. Transfer 1911-12 Inc.....	584·647
Port Stanley, Ont.	<i>Port Stanley B.M.</i> is top of steel plug driven vertically in top course of stone abutment on the North side and at East end of Steel Bridge over Kettle Creek. Transfer 1908-11 Inc.....	586·998
Port Stanley, Ont	<i>Stewarts' B.M.</i> on top of North side of stone abutment of iron bridge crossing Kettle Creek at Port Stanley	587·335

LAKE ONTARIO.

Kingston, Ont	<i>Kingston B.M.</i> is a steel rivet driven vertically into top plinth course S. W. corner of Pumphouse; Kingston Dry Dock. Transfer 1909-12 Inc	252·722
Kingston, Ont. ...	<i>Coping B.M.</i> is point of broad arrow cut in Coping 6 inches from face of wall at inner water gauge West side of dry dock. Transfer 1909-12 Inc.....	251·315
Kingston, Ont	Elevn. of 15·5 mark of sight gauge cut in stone West side of Kingston Dry Dock. Note—bottom of Roman figures—even foot mark... ..	244·815
Kingston, Ont....	Sill of Kingston Dry Dock. Transfer 1909-12 Inc	229·315
Brighton, Ont.....	<i>Brighton B.M.</i> is top of steel plug set vertically in a bastard marble rock about 1,000 feet N.W. of Brighton Wharf, and about 400 feet from the shore. Letters B.M. marked on rock. Transfer 1908-09 Inc....	256·572
Port Dalhousie, O.	<i>Port Dalhousie B.M.</i> is top of iron bolt set vertically in foundation stone of large chimney S.E. end of G.T.R. elevator, East side of Welland Canal. Transfer 1910-12 Inc.....	254·819

WATER SURFACE COMPARISONS DURING OPERATION OF CANADIAN GAUGES.

LAKE ONTARIO.

Year.	Period of Operation.	MEAN DURING PERIOD OF OPERATION.		Ports of Comparison.
		Canadian.	U.S. Official.	
1907....	June 1—Nov. 30 inc.....	246·55	246·56	Toronto and Tibbets Port.
1908....	May 15—Nov. 15 "	247·45	247·69	
1909....	April 14—Nov. 21 "	246·33	246·32	
1908....	May 13—Nov. 17 "	247·56	247·69	Brighton and Tibbets Port.
1909....	April 13—Nov. 23 "	246·34	246·32	
1909....	April 11—Dec. 20 "	246·22	246·19	Kingston and Tibbets Port.
1910....	April 5—Dec. 31 "	245·78	245·77	
1911....	Jan. 1—Dec. 31 "	244·97	244·96	
1912....	Jan. 1—Dec. 31 "	246·03	245·99	
1910....	May 21—Nov. 20 "	245·91	245·90	Port Dalhousie and Tibbets Port.
1911....	May 19—Nov. 16 "	245·08	245·02	
1912....	May 11—Nov. 17 "	246·58	246·52	
Mean during operation....		246·23	246·24	

LAKE ERIE.

1911....	Aug. 1—Dec. 31 inc.....	571·52	571·52	Port Colborne and Buffalo.
1912 ...	Jan. 1—Dec. 31 "	571·85	572·04	
1911....	Aug. 1—Dec. 31 "	571·52	571·44	Port Colborne and Cleveland.
1912....	Jan. 1—Dec. 31 "	571·85	572·02	
1908....	July 6—Nov. 12 "	572·67	572·66	Port Stanley and Cleveland.
1909...	April 17—Nov. 10 "	572·49	572·49	
1910....	April 9—Sept. 30 "	572·33	572·27	
1911....	May 19—Nov. 10 "	571·66	571·65	
Mean during operation....		571·99	572·01	

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Year.	Period of Operation.		MEAN DURING PERIOD OF OPERATION.		Ports of Comparison.
			Canadian.	U.S. Official.	
1906....	May	17—Nov. 27 inc....	581·15	581·14	Collingwood and Harbour Beach.
1907....	May	22—Nov. 28 "	581·30	581·31	
1908....	May	23—Oct. 31 "	581·43	581·43	
1909....	May	1—Nov. 22 "	580·76	580·76	
1910....	Apr.	11—Nov. 21 "	580·24	580·25	
1911....	May	20—Nov. 17 "	579·75	579·73	
1906....	July	1—Nov. 27 "	581·10	581·10	Collingwood and Mackinaw City.
1907....	May	22—Nov. 28 "	581·30	581·29	
1908....	May	23—Oct. 31 "	581·43	581·48	
1909....	May	1—Nov. 22 "	580·76	589·71	
1910....	Apr.	11—Nov. 21 "	589·24	580·21	
1911....	May	20—Nov. 17 "	579·75	579·74	
1906....	Sept.	1—Nov. 21 "	580·82	580·88	French River and Harbour Beach.
1907....	May	14—Nov. 28 "	581·30	581·31	
1906....	Sept.	1—Nov. 21 "	580·82	580·88	French River and Mackinaw City.
1907....	May	14—Nov. 28 "	581·30	581·29	
1910....	May	28—Nov. 17 "	580·30	580·24	Goderich and Harbour Beach.
1911....	May	23—Nov. 15 "	579·74	579·74	
1912....	May	11—Dec. 15 "	580·38	580·43	
1910....	May	28—Nov. 17 "	580·30	580·24	Goderich and Mackinaw City.
1911....	May	23—Nov. 15 "	579·74	579·74	
1912 ...	May	11—Dec. 15 "	580·38	580·43	
	Mean during operation....		580·65	580·65	

Year.	Period of Operation.		MEAN DURING PERIOD OF OPERATION.		Port of Comparison.
			Canadian.	U.S. Official.	
1907....	June	16—Nov. 13 inc....	602·92	602·93	Port Arthur and Marquette, Mich.
1908....	May	25—Nov. 7 "	602·61	602·63	
1909....	May	8—Nov. 12 "	602·16	602·16	
1910....	Apr.	16—Nov. 11 "	601·85	601·86	
1911....	May	12—Nov. 7 "	601·76	601·76	
1912....	May	6—Nov. 26 "	602·34	602·39	
	Mean during operation....		602·27	602·29	

ELEVATIONS OF BENCHMARKS ABOVE MEAN SEA LEVEL AT NEW YORK, DETERMINED BY AUTOMATIC GAUGES OF THE
DEPARTMENT OF PUBLIC WORKS FROM WATER SURFACE TRANSFER.

Year	Lake Ontario.				Lake Erie.		Lake Huron.		Georgian Bay.			Lake Superior
	Brighton B.M. No. 6461.		Toronto B.M.	Port Dalhousie B.M.	Port Stanley B.M.	Port Colborne B.M.	Goderich B.M.		Collingwood B.M. No. 6684		French River B.M. Peters No. 26.	Port Arthur H.M.
	Kingston B.M.	Transfer from Tibbet's Point.			Cleveland.	Buffalo.	Harbour Beach.	Mackinaw City.	Harbour Beach.	Mackinaw City.	Harbour Beach.	Mackinaw City.
1906			254,361						587,903	587,856	591,629	591,631
1907			254,202						587,801	587,751	591,552	591,529
1908		256,649	254,173						587,852	587,806		
1909	252,683	256,495	254,105		587,011				587,873	587,823		
1910	252,782			254,875	586,923		588,512	588,529	587,875	587,852		616,145
1911	252,731			254,804	587,117	584,592	588,502	588,565	587,864			616,119
1912	252,690			254,779		584,734	588,599	588,609				616,127
Mean	252,722	256,572	254,210	254,819	586,998	584,647	588,568		587,852		591,585	616,141

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ANNUAL REPORT OF RADIOTELEGRAPH BRANCH 1912-13.

15th June, 1913.

The Deputy Minister,
Department of the Naval Service,
Ottawa.

SIR,—I have the honour to present herewith the Annual Report of the Radiotelegraph Branch for the fiscal year ending March 31, 1913.

The year has been an eventful one, from a radiotelegraphic standpoint, and many affairs of considerable importance have taken place, particularly the convention of the 'International Radiotelegraphic Conference' in London, England, during June, 1912, and the enactment of further radiotelegraphic legislation by the Canadian Parliament during the present session.

There has been an increase of forty in the number of Radiotelegraph stations in the Dominion and on Canadian ships during the year, as follows:—

Coast stations.. . . .	5
Licensed commercial stations.. . . .	2
Licensed experimental and amateur stations.. . . .	17
Government ship stations.. . . .	4
Licensed ship stations.. . . .	12
	<hr/>
	40
	<hr/>

The total number of stations now in operation is 123, made up as follows:—

Coast stations.. . . .	37
Licensed commercial stations.. . . .	4
Licensed private stations.. . . .	2
Licensed amateur and experimental stations.. . . .	28
Government ship stations.. . . .	16
Licensed ship stations.. . . .	36
	<hr/>
	123
	<hr/>

The following lists give the names of all the land and ship stations now in operation in the Dominion, their owners, and by whom operated.

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COAST STATIONS FOR COMMUNICATION WITH SHIPS.

Nature.	Where Situated	Owned by.	Operated by.	Range in Nautical Miles.
<i>East Coast.</i>				
Belle Isle, Nfld.	Belle Isle Straits	Dominion Government.	Marconi Wire- less Tel. Co. of Canada.	250
Pt. Amour, Nfld.	Gulf of St. Lawrence	"	"	150
Pt. Riche, Nfld.	Gulf of St. Lawrence.	"	"	250
Harrington, P.Q.	"	"	"	150
Heath Pt., P.Q.	Gulf of St. Lawrence (Anti- costi Isld.)	"	"	250
Cape Ray, Nfld.	Cabot Straits	"	"	350
Cape Race, Nfld.	North Atlantic	"	"	400
Grindstone Island, P.Q.	Gulf of St. Lawrence (Mag- dalen Isld.)	"	"	200
Fame Pt., P.Q.	Gulf of St. Lawrence	"	"	250
Clark City, P.Q.	"	"	"	250
Father Pt., P.Q.	River St. Lawrence.	"	"	250
Grosse Isle, P.Q.	"	"	"	100
Quebec, P.Q.	"	"	"	100
Three Rivers, P.Q.	"	"	"	150
Montreal, P.Q.	"	"	"	200
Cape Sable, N.S.	North Atlantic	"	"	250
Partridge Isld., St. John, N.B.	Entrance St. John, N.B. Harbour.	"	"	250
Cape Bear, P.E.I.	Northumberland Strait	"	"	150
Pictou, N.S.	"	Marconi Wire- less Tel. Co. of Canada.	"	100
North Sydney, C.B.	North Sydney, C.B.	"	"	100
Camperdown, N.S.	Entrance to Halifax Har- bour.	"	"	250
Sable Island, N.S.	North Atlantic.	"	"	300

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COAST STATIONS FOR COMMUNICATION WITH SHIPS. *Continued.*

Name.	Where Situated.	Owned by.	Operated by.	Range in Nautical Miles.
<i>Great Lakes.</i>				
Port Arthur, Ont.....	Port Arthur, Ont.....	Dominion Government.	Marconi Wire- less Tel. Co. of Canada.	250
1 Sault Ste. Marie, Ont..	Sault Ste. Marie, Ont.....	"	"	350
2 Tobermory, Ont.....	Entrance Georgian Bay..	"	"	350
2 Midland, Ont.....	Georgian Bay..	"	"	350
3 Point Edward, Ont.....	Lake Huron	"	"	350
<i>West Coast</i>				
Victoria, B.C.	Victoria, B.C.....	Dominion Government.	Dominion Government.	250
Pt. Grey, B.C., Vancouver..	Entrance Vancouver Harbour	"	"	150
Cape Lazo, B.C.....	Strait of Georgia, near Comox, B.C.	"	"	350
Pachena Pt., B.C.....	West Coast Vancouver Isld..	"	"	300
Estevan Pt., B.C..	"	"	"	500
Triangle Isld., B.C.....	South of Hecate Str.....	"	"	450
Ikeda Head, B.C.....	South of Moresby Island, Q.C.I.	"	"	250
Dead Tree Pt., B.C.....	South of Graham Isld., Q.C.I.	"	"	200
Prince Rupert, B.C.....	Digby Isld. Entrance Prince Rupert Harbour.	"	"	250
4 Alert Bay, B.C.....	Cormorant Isld., B.C.....	"	"	350
<i>Licensed Commercial Stations. Long Distance.</i>				
Glace Bay, C.B.....	Near Glace Bay, C.B.....	Marconi Wire- less Tel. Co. of Canada.	Marconi Wire- less Tel. Co. of Canada.	3,000
Bowen Island, B.C.....	Bowen Isld., B.C., Strait of Georgia.	Canadian Ex- plosives Co., Montreal.	Owners....	30
5 Louisburg, C.B.....	Cape Breton.....	Marconi Wire- less Tel. Co. of Canada.	Marconi Wire less Tel. Co. of Canada.	Reception only.
5 Ocean Falls.....	Ocean Falls, B.C.....	Ocean Falls Co	Owners....	150
<i>Licensed Private Stations.</i>				
Toronto, Ont.....	Toronto, Ont.....	Goodyear Tyre and Rubber Co. Toronto.	Owners....	50
Bowmanville, Ont.....	Bowmanville, Ont.....	"	"	70

1. New station placed in commission August, 1912.
2. New station placed in commission July, 1912.
3. New station placed in commission opening navigation, 1913.
4. New station placed in commission January 17, 1913.
5. New station erected during fiscal year, 1912-13.

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LICENSED EXPERIMENTAL AND AMATEUR STATIONS.

Name.	Address.	Call letters.
Elderkin, Karl O.	Weymouth, N.S.	XAJ.
Cuthbert, David	Bamfield, B.C.	Reception only.
Lawson, Donald	Yarmouth, N. S.	XAI.
O'Hanley, Charles John	Yarmouth, N. S.	XAK.
Fowler, W. D.	388 Roslyn Ave., Montreal	XAM.
Cooper, J. K.	Vancouver, B. C.	XAL.
Lockyer, R. H. N.	Vancouver, B. C.	XAB.
Militia and Defence, Dept. of.	Charlottetown, P. E. I.	XAN.
Teel, Jay G.	170 Rielle Ave., Verdun, P. Q.	XAP.
Vaughan, Frank P.	St. John, N. B.	XAO.
St. Aubin, A.	67 Church St., Montreal.	XAC.
Auld, E. W.	Charlottetown, P. E. I.	XBA.
Buckle, H. B.	Verdun, P. Q.	XAU.
Barnes, George H.	Meighs Corners, P. Q.	XAS.
Gray, Wm. H.	North Vancouver, B. C.	XAV.
Harrison, Cyril G.	Victoria, B. C.	XBC.
Hun Jack Oak	St. John, N. B.	XBB.
Jackson, W. Franklin	Victoria, B. C.	XAZ.
Jeune, Herbert H.	Victoria, B. C.	XAW.
Leonard, Percy C.	Victoria, B. C.	XAX.
McCall, James D.	Montreal, P. Q.	XBD.
Peirce, Wallace A.	Victoria, B. C.	XAY.
Pickard, Harold L.	Charlottetown, P. E. I.	XAT.
Rogers, K. S.	Charlottetown, P. E. I.	XAR.
Stiles, Raymond D.	Pictou, N. S.	XBG.
St. Laurent, Adrien	Ottawa, Ont.	XBF.
Stewart, H. Ronald	Charlottetown, P. E. I.	XAQ.
Thompson, Trevor C.	Montreal, P. Q.	XBE.

LICENSED SHIP STATIONS.

Name of Ship.	Port of Registry.	Name of Owners.	Name of Company operating the Station.
S.S. Assiniboia	Montreal, P.Q.	C.P.R.	Marconi Wireless Tel. Co. of Canada.
" Alberta	"	"	"
" Athabaska	"	"	"
" Manitoba	"	"	"
" Keewatin	"	"	"
" Boston	Yarmouth, N.S.	"	"
" Hamonic	Collingwood, Ont.	Northern Nav. Co.	"
" Huronic	"	"	"
" Imperial	Sault Ste. Marie, Ont.	Great Lake Towing & Wrecking Co.	"
" Province	Port Arthur, Ont.	"	"
" Empire	"	"	Owners.
" Salvor	Victoria, B. C.	B.C. Salvage Co.	"
" Prince Rupert	Newcastle, C.B.	G.T.P. Co.	"
" Prince George	"	"	"
" Prince Albert	Prince Rupert, B.C.	"	"
" Prince John	"	"	"
" Florence	Toronto, Ont.	T. Eaton	Marconi Wireless Tel. Co. of Canada.
" Princess Beatrice	Victoria, B.C.	C.P.R.	"
" Princess Charlotte	"	"	"
" Princess May	Vancouver, B.C.	"	"
" Prince Royal	Victoria, B.C.	"	"
" Princess Victoria	London, G.B.	"	"
" Tees	Victoria, B.C.	"	"
" Camosun	Glasgow, G.B.	Union Steamship Co.	Owners.

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Name of Ship.	Port of Registry.	Name of Owners.	Name of Company operating the Station.
1 S.S. Princess Adelaide	Victoria, B.C.	C.P.R.	Marconi Wireless Tel. Co. of Canada.
1 " " Mary....	"	"	"
1 " " Alice....	"	"	"
1 " " Ena....	"	"	"
1 " " Sophia ..	"	"	"
1 " Saronic	Sarnia, Ont.	Northern Nav. Co.	"
1 " Lord Strathcona..	Quebec, P.Q.	Quebec Salvage Co.	"
1 " A. W. Perry.....	Halifax, N.S.	Plant Line.	"
1 " Aranmore	Glasgow	Holliday Bros.	"
2 " Royal Edward....	Toronto, Ont.	Northern Nav. Co.	"
2 " " George.....	"	"	"
1 S.Y. Aquilo.....	Vancouver, B.C.	B. J. Rogers	Owners.

1. Installed during fiscal year 1912-13.
2. First Canadian license for installation issued during year.

OPERATION AND MAINTENANCE OF THE COAST STATION SERVICES.

The Coast Station Services on the East Coast, West Coast and the Great Lakes have all been maintained and operated at a high standard of efficiency throughout the year, and the increase in the amount of business handled is very gratifying (75,837 messages—1,436,314 words).

A thorough inspection has been made of each station and the few small faults reported have been corrected at once, either by our own staff, or, in the case of those stations operated under a contract with this department, by the operating company.

No break-downs of consequence occurred during the year.

TRAFFIC AND COMMERCIAL BUSINESS HANDLED BY THE COAST STATION SERVICE.

Two hundred and seventy two thousand and eighty seven messages, containing 4,275,759 words, were handled during the year by the Coast Station services, against 196,250 messages, 2,839,445 words during the preceding year, an increase of 75,837 messages and 1,436,314 words, and an excellent idea of the increasing use which is being made of our service from year to year may be obtained from the following comparative table showing the business during each of the past four years.

COMPARATIVE statement of total business handled by the Coast Station Services during the last four years.

Service.	1909-10.		1910-11.		1911-12.		1912-13.	
	Messages.	Words.	Messages.	Words.	Messages.	Words.	Messages.	Words.
East Coast	65,608	956,370	71,594	1,179,434	119,049	1,824,450	153,843	2,704,411
Great Lakes (Port Arthur).	Nil.	.....	Nil.	.....	1,043	17,095	2,750	52,422
West Coast.....	18,469	265,414	48,074	647,461	76,158	997,900	115,494	1,518,926
Totals.....	84,077	1,221,784	119,668	1,826,895	196,250	2,839,445	272,087	4,275,759

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The revenue accruing to the department from the business handled at the different stations also shows a gratifying increase. Practically the whole of this accrues from the West Coast service, which is operated directly by the department.

All of the stations on the East Coast are operated by the Marconi Wireless Telegraph Company of Canada, Limited, under a contract with the department, and under the terms of which they retain all tolls, with the exception of those received at the Magdalen Islands station.

In this particular case all tolls collected accrue to the Government until they amount to \$1,350 per annum.

In the case of the Great Lakes stations, the Government receives a certain percentage of all revenue collected at each of the stations, calculated on the following sliding scale:—

Five per cent of all amounts up to \$500.

When amounting to more than \$500, but less than \$1,000, 5 per cent of the first \$500 and 10 per cent of the second \$500, or portion thereof.

When amounting to more than \$1,000, but less than \$2,000, 7½ per cent of the first thousand and 15 per cent of the second thousand.

When amounting to more than \$2,000, but less than \$3,000, 7½ per cent of the first thousand, 15 per cent of the second thousand and 20 per cent of the third thousand.

When amounting to more than \$3,000, 7½ per cent of the first thousand, 10 per cent of the second thousand, 20 per cent of the third thousand and 30 per cent of all over \$3,000.

The business handled by the stations on the Great Lakes this year was very small, and our percentage of the total revenue amounted to only \$17.08.

The following comparative statement shows the revenue received from the different services during the past four years, namely:—

COMPARATIVE STATEMENT of Revenue received by the Coast Station Services during the past four years.

Service.	1909-10.	1910-11.	1911-12.	1912-13.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.
East Coast	Nil.	Nil.	229 57	475 00
Great Lakes	Nil.	Nil.	Nil.	17 08
West Coast	Nil.	3,108 63	4,484 77	9,928 40
Totals	Nil.	3,108 63	4,714 34	10,420

DETAILED Statement of business handled by the Ten stations on the Pacific Coast owned and operated directly by this Department.

Name of Station.	Private business to and from ships.		Private business between stations.		Business to and from Government ships.		Government business between stations.		Service messages.		Retransmitted messages.		Cost of Maintenance.	Revenue.
	Mess-ages.	Words.	Mess-ages.	Words.	Mess-ages.	Words.	Mess-ages.	Words.	Mess-ages.	Words.	Mess-ages.	Words.		
Pachena	76	859	21	342	31	532	100	2,360	2,681	25,307	16,270	219,001	4,265 61	42 18
Estevan.	914	8,416	23	305	28	635	51	903	2,451	28,381	13,131	176,013	4,387 08	905 82
Dead Tree Point.....	1	7	1,686	33,130	9	176	7	208	1,493	10,337	11	130	2,639 74	772 80
Ikeda Head	26	242	544	7,523	22	801	10	225	2,133	16,771	521	7,423	3,067 77	347 39
Triangle Island	1,253	15,016	4	51	61	2,219	815	5,701	3,851	43,688	14,020	194,565	4,295 61	674 21
Point Grey	1,533	18,508	1,309	21,743	59	1,359	51	791	4,260	56,053	273	4,399	4,596 16	742 80
Victoria.....	3,882	44,375	5,340	92,192	387	10,052	2,394	32,735	15,258	187,685	4,222	63,926	5,204 16	3,428 24
Prince Rupert.....	719	8,258	4,406	58,078	67	1,350	339	7,631	3,221	42,854	5	141	4,849 86	2,675 71
Cape Lazo.....	691	10,001	731	10,123	88	1,860	99	2,135	2,631	26,442	1,056	12,741	3,808 38	324 61
Alert Bay.....	8	146	30	270	.....	.....	1	8	187	1,803	.....	.....	307 57	14 64
Total.....	9,103	105,828	14,094	223,757	752	18,984	3,870	52,697	38,166	439,321	49,509	678,339	37,412 94	9,928 40

Total number of messages handled.....	115,494
" " words	1,518,926
Upkeep local office at Victoria, B.C.....	4,639 41
General account Charter of Steamers, freight, travelling expenses, &c.....	5,180 71
Cost of maintenance of stations	37,412 94
Total cost of maintenance	47,983 76
Total revenue	9,928 40

Detailed Statement of business handled by Four stations on the Great Lakes owned by the Department of the Naval Service and operated by the Marconi Wireless Telegraph Company of Canada, Limited.

Name of Station.	Private business to and from ships.		Private business between stations.		Business to and from Government ships.		Government business between stations.		Service messages.		Retransmitted messages.		Cost of Main-tenance.	Revenue.
	Mess-ages.	Words.	Mess-ages.	Words.	Mess-ages.	Words.	Mess-ages.	Words.	Mess-ages.	Words.	Mess-ages.	Words.	\$ cts.	\$ cts.
Port Arthur.....	222	2,849	399	6,454					791	13,630			3,474 16	14 58
Tobermory.....	19	431	8	125					199	6,170			2,389 79	0 80
Midland.....	112	1,343	11	188					392	9,193	278	6,738	2,217 38	1 70
Sault Ste. Marie.....							2	24	161	3,571	31	701	1,998 50	
Total.....	353	4,623	418	6,767			2	24	1,543	32,564	434	8,444	10,079 83	17 08

Total number of messages handled..... 2,750
Total number of words handled..... 62,422
Total cost of maintenance..... 10,079 83
Total Revenue..... 17 08

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Detailed Statement of business handled by the Four stations on the East Coast, owned and operated by the Marconi Wireless Telegraph Company of Canada, Limited, under contract with the Department of the Naval Service.

Name of Station.	Private business to and from ships.		Private business between stations.		Business to and from Government ships.		Government business between stations.		Service messages.		Retransmitted messages.		Cost of Main-tenance.	Revenue.
	Mess-ages.	Words.	Mess-ages.	Words.	Mess-ages.	Words.	Mess-ages.	Words.	Mess-ages.	Words.	Mess-ages.	Words.		
Sable Island	6,499	71,021	2,770	37,156	361	6,243	1,029	9,839	4,468	76,261			\$	cts.
Halifax	169	2,644	1,791	19,831	325	5,657	1,114	12,618	4,656	75,066				
North Sydney	80	1,289	50	996	281	5,579	1,562	12,379	1,247	21,989	1	4		
Pictou	16	296	12,100	283,111	522	11,527	178	3,178	597	13,845	53	1,248		
Totals	6,764	75,250	16,711	341,094	1,489	29,006	3,883	38,005	10,968	187,161	54	1,252	3,500	00

Total number of messages handled.....	39,869.
Total number of words handled.....	\$670,768.
Total cost of maintenance.....	\$3,500.
Total revenue	

DETAILED Statement of business handled by the Eighteen stations on the Gulf of St. Lawrence and East Coast, owned by the Department and operated by the Marconi Wireless Telegraph Company of Canada, Limited.

Name of Station.	Private business to and from ships.		Private business between stations.		Business to and from Government ships.		Government business between stations.		Service messages.		Retransmitted messages.		Cost of Main-tenance.	
	Mess-ages.	Words.	Mess-ages.	Words.	Mess-ages.	Words.	Mess-ages.	Words.	Mess-ages.	Words.	Mess-ages.	Words.	\$	cts.
Cape Sable	2,828	34,546	5	52	212	3,476	170	1,966	2,647	52,693	...	...	3,520	00
St. John	36	437	296	11,379	381	7,051	63	854	371	6,695	33	602	3,500	00
Cape Race	4,480	49,497	...	...	271	5,119	...	...	2,753	40,798	...	...	3,500	00
Magdalen Islands	...	...	2,625	64,970	31	684	312	2,012	1,056	20,149	875	20,343	1,200	00
Cape Bear	1	15	11,024	239,085	579	13,789	55	842	188	4,008	869	24,494	2,500	00
Point Rich	58	775	76	1,253	238	4,203	4	84	963	13,941	4,844	86,325	3,500	00
Point Amour	40	448	454	7,472	145	2,571	924	7,052	2,025	24,098	3,392	66,574	3,500	00
Belle Wale	254	3,482	143	2,387	407	6,872	1,517	11,695	2,556	33,009	4,499	93,196	4,577	30
Cape Ray	269	3,459	712	10,581	102	1,904	1,987	15,249	2,995	71,565	739	13,237	3,500	00
Harrington	4	43	30	596	28	480	257	1,222	352	2,957	17	389	2,500	00
Heath Point	230	2,833	365	8,679	281	5,747	837	6,751	3,682	46,797	9,944	157,412	3,500	00
Fame Point	343	4,479	1,344	34,367	177	2,772	3,326	20,557	7,211	149,709	742	10,315	3,580	00
Clarke City	81	7,314	2,219	81,903	125	2,751	194	1,627	1,917	43,806	1,772	31,392	3,500	00
Father Point	791	12,269	1,740	63,700	341	5,016	570	5,160	2,502	44,111	156	6,247	3,500	00
Croise Isle	192	3,802	162	2,182	834	13,045	1,508	30,552	725	14,947	712	10,254	2,500	00
Quebec	458	8,910	171	2,736	453	6,259	1,596	29,710	1,008	19,934	206	3,445	2,500	00
Three Rivers	196	2,216	18	200	293	4,629	...	...	716	13,243	638	11,677	3,500	00
Montreal	185	2,026	19	310	36	461	2	19	761	13,384	...	...	3,500	00
Totals	10,446	136,461	21,403	531,852	4,934	86,829	13,322	135,755	34,431	606,844	29,438	535,902	57,877	30 475 00

Total number of messages handled	113,974
Total number of words handled	2,033,643
Total cost of maintenance	857,877 30
Total Revenue	8475 00

CONSTRUCTION.

NEW STATIONS AND ADDITIONS, ALTERATIONS AND ENLARGEMENT TO EXISTING STATIONS.
EAST COAST.

Father Point.—The first step towards the establishment of wireless communication between Father Point and Quebec was the installation of a second mast at the Father Point station, to provide for the erection of an aerial of sufficient capacity to communicate over the distance.

Public tenders were called for the erection of the mast, and the contract was awarded to the lowest tenderers, Messrs. The Marconi Wireless Telegraph Company of Canada, Limited, for the sum of \$2,350.

This work has been completed, including the erection of the aerial, and all is now in readiness to undertake tests between Father Point and Quebec, as soon as the enlargement of the latter station is finished.

It is anticipated that work on the Quebec station will be commenced at an early date, and communication established before the end of this summer.

GREAT LAKES.

Four new stations at Sault Ste. Marie, Midland, Tobermory and Point Edward were completed and placed in operation during the year, and work on the enlargement of the Port Arthur station, with a view to the establishment of direct communication with the Sault Ste. Marie station in the daytime, is now in progress.

Sault Ste. Marie.—The erection of the Sault Ste. Marie station, which was commenced in 1911, has been completed, and the station was placed in operation on August 7, 1912, the expenditure in this reference during the fiscal year being \$807.99.

Tobermory.—The establishment of a station at Tobermory, which was commenced in 1911, has been completed, and the station was placed in operation on July 26, 1912; the expenditure during the fiscal year in this connection was \$926.09.

Midland.—The erection of the station at Midland, which was commenced in 1911, has been completed, and the station was placed in operation on July 8, 1912; the expenditure during the fiscal year for this work amounted to \$1,069.99.

Point Edward.—A complete new station consisting of a Type No. 3 operating-house, 40 feet by 20 feet, two 185-foot housing-masts and a 10 H.P. 5½ K.W. wireless equipment, in duplicate, was established at Point Edward, near Sarnia, Ontario, during the year, at a total cost of \$13,877.27.

An excellent site for the station was secured on the Ordnance Reserve at Point Edward. The land is at present held by the Grand Trunk railway under lease from the Interior Department and our site is sublet to this department by that company.

Public tenders were called for the erection of the masts and buildings, and the contract was awarded to the lowest tenderers, Messrs. The Chaudière Machine and Foundry Company, of Ottawa, for the sum of \$6,150.

The wireless equipment, which is in duplicate, consists of a 10 H.P. motor directly connected to a 5½ K.W. 240 cycle generator, fitted with a synchronous disc discharger on the same shaft. The station has a normal range of 350 nautical miles over the water under all conditions.

An 8 H.P. gasoline engine is installed as an auxiliary prime mover in case of break-down of the power supply.

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The contract for the apparatus, aerial and the installation thereof was awarded to the Marconi Wireless Telegraph Company of Canada, Limited, for the sum of \$6,174.20.

Work on the above station was completed and it was placed in operation at the opening of navigation in 1913.

WEST COAST.

The stations at Pachena and Cape Lazo have been enlarged to $5\frac{1}{2}$ K.W. capacity, giving them a range of 500 miles over water, and a new dwelling-house was installed at cape Lazo to accommodate a second married operator.

A second mast has been erected at Dead Tree Point Station, increasing the range of that station to 200 miles, and repairs were made to the buildings and mast at Triangle island damaged by the severe gales encountered there last winter.

Details are as follows:—

Cape Lazo.—Public tenders were called for the erection of a second dwelling at Cape Lazo and the contract was awarded to the lowest tenderer, Mr. James Carthew, Comox, B.C., for the sum of \$3,600.

This work has been completed, and the dwelling has been occupied since July, 1912.

Esteran.—A Type No. 2 operating-house has been erected at Estevan and a $5\frac{1}{2}$ K.W. equipment installed.

The original operating-house will be refitted as a dwelling for the single operators, thus providing accommodation for a staff of four men at the station.

The total cost of the above work amounted to \$5,375.04.

Pachena.—A new Type No. 2 operating-house was erected at Pachena and a $5\frac{1}{2}$ K.W. equipment installed. The original operating-house was refitted as a dwelling-house to accommodate the single operators.

A tree was fitted as a second mast, and some clearing was done on the site.

The total cost of the above work amounted to \$5,845.65.

Dead Tree Point.—Work on the erection of the second mast at Dead Tree Point station was carried to completion and a 'T' aerial erected between that and the original mast, increasing the range of the station from 150 to 200 miles.

The cost of this work, charged against the present fiscal year, was \$667.20.

Triangle Island.—The buildings and masts at the Triangle Island station were overhauled, painted and placed in good condition after the extremely severe gales experienced there last winter.

The cost of the above work was \$597.90.

Alert Bay.—A complete new station, consisting of a Type No. 1 dwelling-house, a Type No. 2 operating-house, one 8 H.P. $5\frac{1}{2}$ K.W. transmitter and one 6 H.P. 2 K.W. transmitter was erected at Alert bay, Cormorant island, B.C.

An excellent site, four acres in extent, was secured from the British Columbia Packers Association, immediately to the north of their wharf at Alert bay; also a right of way from this site to their wharf.

The site and right of way, which were heavily timbered, were cleared and a tramway, 900 feet long extending from the site to the wharf was installed.

A 6 H.P. gasoline hoist and car were put in to handle the building material.

The top was taken off a suitable standing tree on the site and a top mast fitted thereto, making a mast 180 feet high over all, thus effecting a considerable saving in erection costs.

Work on the erection of a second mast was commenced, but could not be completed owing to delay in delivery of the castings for mast bands.

The station was completed and placed in commission on January 17, 1913, the communication with both Triangle island and Ikeda Head proving very satisfactory.

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Work on the erection of the second mast has been resumed and it will be completed in the course of the next two weeks.

The total cost of the station was \$20,803.36.

HUDSON BAY.

Plans and specifications for buildings, masts and apparatus for two stations to be installed, one at Port Nelson, Hudson bay, and one at Le Pas, Manitoba, the terminal points of the Hudson Bay railroad, were prepared for the Railways and Canals Department, who have called for tenders on the same.

The distance over which the communication is to be effected is 400 miles overland.

We understand the contract for the work has been awarded to the Marconi Wireless Telegraph Company of Canada, Limited, who have contracted to provide the necessary communication with a 20 H.P. 10 K.W. equipment at both stations.

It is expected that these stations will be placed in operation about October, 1913.

GENERAL REVIEW OF WIRELESS SITUATION.

WEST COAST.

The establishment of a station at Alert bay provides radio facilities for communication with ships for 100 miles of the inside passage located between Queen Charlotte sound and Chatham point, hitherto unreached by any station, and at the same time gives the settlement of Alert bay telegraphic connection with the outside world. This settlement is perhaps the most important one on the inside passage between Comox and Prince Rupert, as it is a port of call for practically all the small craft plying in those waters, and at the same time the centre of a large canning industry.

This station, which was placed in commission in January, has hardly been in operation for sufficient length of time to enable us to form an estimate of the revenue it is likely to bring to the service, but there is every reason to believe that, in course of time, it will become one of our best paying stations.

The congestion of radio traffic around the southern end of Vancouver island, and the consequent interference with the efficient operation of our service has been relieved to a considerable extent by the installation of increased power at the Estevan and Pachena stations, and the establishment of direct communication between these points and Cape Lazo on the east coast of the island. These circuits do not suffer from interference to anything like the same extent as the Victoria-Pachena circuit, and most of our commercial business is now being handled via Cape Lazo and from thence to Point Grey, where it is transferred to the land lines for delivery.

Interference, the 'bête noire' of radio-telegraphy, continues to be the chief difficulty we have to contend with, particularly at the stations located on the south and west coasts of Vancouver island, Victoria, Pachena and Estevan.

There are now some eighteen coast and land stations within a radius of one hundred miles of Victoria, and not less than eighty ship stations on steamers plying regularly to British Columbia ports. In addition to the interference from these stations whose operation is more or less regulated, we get at night every station on the west coast of California down to Panama, and it can easily be appreciated that efficient working is difficult.

Fortunately our northern stations, including Cape Lazo, are not affected to anything like the same extent as the stations mentioned above and, when in the future, we find it necessary to provide another route for our ever-increasing traffic, the

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establishment of a chain of stations along the inside passage will afford us considerable relief. The erection of a station at Alert bay is one step towards this, and with one more station erected in the neighbourhood of Chatham point we will have a second chain of stations from Rupert to Vancouver practically distinct from our present system and comparatively immune from interference. At the same time, a station at Chatham point would provide facilities for radio communication with ships along a part of the inside passage not now reached by existing stations owing to the mountainous character of the country in that vicinity.

We are pleased to hear that the Public Works Department are about to instal a land line system between Massett and Queen Charlotte City on the Northern island of the Queen Charlotte group; this line will be connected to our Dead Tree Point station, and should prove a valuable feeder for our system.

It is perhaps not generally known that our two stations at Dead Tree Point and Ikeda Head on the islands, constitute the only means of telegraphic communication between Queen Charlotte islands and the outside world.

Up to the present we have only been able to extend telegraph facilities to settlements within a radius of about ten miles of the stations by means of short telephone lines, but on the completion of the proposed land line our service will be in direct touch with practically every settlement of importance on the group, and it is only reasonable to anticipate that there will be a very great increase in the amount of business and revenue accruing to our service.

The lack of telegraphic facilities on the sea coast of British Columbia, and the remote and scattered nature of the settlements along the coast, render it an ideal field for the installation of wireless services since land lines can only be maintained at a prohibitive expense through the mountainous and heavily timbered country encountered.

Two radiotelegraph stations to communicate with our west coast chain have already been installed, under licenses, by private interests at Ocean Falls, B.C., and Bowen island, B.C., and as the country develops there will be numerous applications for further licenses.

These stations will be regulated to work on wave lengths which will not interfere with the working of our stations, and stand-by times will be arranged with the nearest station of our chain so that traffic may be exchanged every two hours. In the meantime the operator at the licensed station can be employed on other work.

Such stations should, in time, become a source of considerable revenue to our service; they cost us nothing to maintain, and every message they send or receive is a source of profit to us. The only trouble that is foreseen in this connection is embarrassment in numbers, and they may eventually give us so much business that the efficiency of our coast station chain, as an aid to navigation, may be interfered with. Should this ever come to pass, there is no doubt that the revenue accruing from their business will be sufficient to justify the erection of a chain of stations specifically for the handling of such traffic, and arranged to work on wave lengths which would not interfere with the operation of the regular coast stations.

The establishment of a workshop at Esquimalt has proved a great success. We are now undertaking practically all our own repairs and handling them at a very much lower price and much more promptly than when we had them undertaken by outside firms.

Stress of work has prevented us from undertaking more than a few tentative experiments in the way of development and improvement of the apparatus, but we hope that opportunities will occur during the coming year to do some useful work along these lines.

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GREAT LAKES.

The establishment of the proposed chain of eight coast stations on the Great Lakes is in progress and will be completed during the summer of 1913.

At the present moment, five of these stations, extending from Port Arthur, Ontario, to Point Edward, Ontario, are in commission, and wireless facilities for ships plying on lake Superior, lake Huron and Georgian bay are now provided.

The three stations which remain to be built will be situated at Kingston, Ontario, Toronto, Ontario and Port Burwell, Ontario. A suitable site has been secured at each point, and tenders will shortly be called for the works. These three stations are intended to provide wireless facilities for ships plying on lakes Erie and Ontario.

The small station at Port Arthur, transferred from the Marconi Company, in 1911, to the department, is now in course of enlargement with a view to the establishment of day and night communication with the station at Sault Ste. Marie. This communication is at the present time limited to night working. The existing ranges of these two stations are, of course, ample to establish communication with ships at any point on lake Superior.

It is intended that the station at Kingston shall communicate with a similar station at Montreal, thus connecting up the Great Lakes chain, with that on the East Coast.

EAST COAST.

At the present time our main East Coast system terminates with the station at Father Point, and a smaller system extending from Grosse Isle to Montreal is provided to communicate with ships when in the river St. Lawrence proper.

Work on the connecting up of these two systems is now in progress in order that through communication from Montreal to the ocean may be established, and to this end a second mast and a big aerial have been installed at Father Point, and negotiations have been entered into with the National Battlefields Commission for the acquirement of a site at Quebec on one of their reserves on which an enlarged and improved station will be erected. The Commissioners have shown themselves favourably disposed to consider our request, and we are about to submit plans of buildings and masts for their approval.

As soon as the Quebec station is completed, experiments will be undertaken with the existing 4 H.P. set at Father Point, and it is expected that this set, when used in conjunction with the new aerial, will be sufficient to establish the desired communication.

Notice has been received from the Harbour Commissioners at Montreal that we must remove our Montreal station from its present site on the Tarte pier at an early date, and negotiations are now in progress to obtain another site for the same.

After two years of negotiation, arrangements have at last been made with the different land line companies to adopt the 'International Method' of computation of charges in connection with the transmission of radiotelegrams to and from ships at sea, and new rates based on this method were filed with the Board of Railway Commissioners, and have been in force at all telegraph offices in North America since the 1st of December, 1912.

In consequence of the above, Canada is now able to comply with the provisions of the International Radiotelegraphic Conference in their entirety, and the European Administrations no longer have any ground for complaint in this respect.

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THE GOVERNMENT WIRELESS SERVICE AND SHIPPING DISASTERS.

EAST COAST.

Foundering of the SS. 'Titanic.'

The foundering of the *Titanic* and the events subsequent thereto, did more to bring the utility of radio-telegraphy before the eyes of the public than any other incident that has happened before or since.

On April the 10th, 1912, the White Star liner *Titanic* left Southampton, England, on her maiden voyage to New York, and on the 14th at 2.20 a.m., when 575 miles south-east of Cape Race, Newfoundland, effected communication with our station at that point, which was maintained throughout the day until sunset.

At 10.25 p.m. that night, when in latitude 41.46 north, longitude 50.14 west, she struck an iceberg and a few hours afterwards sank with 1,600 persons, including the chief wireless operator, still on board.

Immediately after the accident occurred the distress signal was sent out and was answered by the Allan liner *Virginian*, some 300 miles north, and by the Cunard liner *Carpathia* thirty miles to the south.

Constant communication was maintained between the *Titanic* and these and other vessels; first, by means of her power equipment, and afterwards, when her dynamos were submerged, by her emergency equipment, until at last the operators were compelled to abandon the wireless cabin a few minutes before the vessel actually sank.

The *Carpathia*, on receipt of the news, immediately headed for the scene of the accident, but could not arrive in time to render any assistance other than to rescue those passengers who had escaped in the life boats.

The news of the disaster first reached the outside world via the *Virginian* and the Cape Race station, and the list of those saved was sent by the *Carpathia* to the *Olympic* and thence to Cape Race.

Communication was next established between the *Carpathia* and the Sable Island station, but, owing to the fact that the ship was only fitted with a small emergency wireless set, which was incapable of effecting communication over more than 150 miles, and unsuitable for the transmission of large numbers of messages, and also partly on account of bad atmospherics, practically no business was handled.

The fact that so little authentic information with regard to the disaster was received during the three days which elapsed prior to the arrival of the *Carpathia* at New York is attributable directly to this, and not to any censorship exercised by the Marconi Company or the captain of the vessel.

From a wireless standpoint, the disaster shows very clearly the futility of maintaining anything but a constant watch at the wireless stations on such vessels.

It was only by the merest chance that the *Carpathia* operator happened to be listening in at the moment the distress signal was sent out, for the simple reason that no watch was being maintained, while the SS. *Californian* which, at the time of the disaster, was actually nearer the *Titanic* than the *Carpathia* (near enough in fact, to see the rockets sent up from the ill-fated ship), did not even know of the accident until the vessel had foundered and the survivors had been picked up by the *Carpathia*.

It is, of course, absurd to expect one man to maintain a constant 24-hour watch during an entire voyage, and since no reliable call device, suitable for use on ships,

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has yet been perfected, a second operator, or at least a man capable of recognizing the distress signal when he hears it, should be provided on every vessel.

This matter, together with the compulsory equipment of radio-apparatus on certain vessels and the nature and range of their equipment, will undoubtedly be discussed at the 'International Conference for Safety at Sea,' to be held in London about October next. The question was considered at the International Radiotelegraphic Conference, when, as is stated in the section of this report dealing with that subject, it was decided that ships should be divided into three classes, vessels in the first class to carry two qualified operators, those in the second class to carry one qualified operator and a second class operator or a watcher, and those in the third class a second class operator, and the watches to be kept by each class of vessel were prescribed.

Just how this classification of ships should be effected was not decided, it being considered that this was a matter to be dealt with by the various Governments to which the ships belonged.

A certain degree of uniformity in these matters is, of course, essential, and the section of the report of the 'Conference for Safety at Sea' dealing with this question, is awaited with interest.

The far-sighted policy of the Marconi Company in installing on board ships an emergency equipment in addition to their regular equipment, has once more been exemplified in the case of the *Titanic* disaster, and in this connection it is observed that the United States Government has already passed legislation compelling the installation of such emergency equipments in addition to the regular equipment on all steamers, while under our own legislation the Minister of the Naval Service has power to compel a similar equipment.

EAST COAST.

Collision between R.M.S. 'Empress of Britain' and the SS. 'Helvetia.'

On July 27, 1912, at 5.55 p.m., the C.P.R. liner *Empress of Britain*, in a thick fog off Fame point in the gulf of St. Lawrence, rammed and sank the British steamer *Helvetia*, and was herself badly damaged.

The sea was smooth and the crew of the latter steamer were all rescued.

Communication was immediately established with our radiotelegraph stations at Fame point and Clarke city, and from the time the accident occurred until the *Empress of Britain* reached Quebec, she was never out of touch with one or other of the stations of the St. Lawrence chain.

The public were naturally alarmed for the safety of the vessel, and the part that the wireless service played in keeping them informed of the progress and condition of the vessel was very much appreciated.

R.M.S. 'Corsican' in collision with an Iceberg.

On August 12, 1912, at 3.45 p.m., the Allan liner *Corsican*, bound from Quebec to Liverpool, struck an iceberg about 120 miles east of Belle Isle. Communication was immediately established with our Belle Isle station, and at 4.05 p.m. the message was transmitted to the SS. *Scandinavian* by the station, which ship immediately proceeded through a dense fog in search of the injured vessel.

Had the *Corsican* not been steaming slowly at the time of the accident, another bad disaster might easily have resulted; as it was, however, little damage was done, and after a delay of two days on account of fog, she proceeded at reduced speed, on her voyage to Liverpool, where she arrived in safety.

From the time the accident occurred until the voyage was resumed, the *Corsican* was never out of touch with the Belle Isle station, and during the whole time

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across was in constant communication with passing vessels, so that aid could have been secured at a moment's notice if necessary.

Wreck of the SS. 'Eric' on Sable Island.

On August 17, 1912, at 11.30 a.m., the SS. *Eric*, bound from Rosario to Miramichi, ran ashore on Sable island during a dense fog. She was not equipped with a radiotelegraph set, but as soon as the island life saving crew had obtained news of the wreck, the details were forwarded to the mainland by means of the radiotelegraph stations at Sable island and Camperdown (Halifax), and the various wrecking concerns of that vicinity were advised by the agent of the Marine and Fisheries Department at Halifax.

In spite of the fact that the boat was lying quietly off the shore, it was impossible to signal to her by flags because of the prevailing thick weather. The Marconi Company accordingly installed a temporary set of apparatus aboard her and, until the evening of the 20th, when she was abandoned, constant communication was maintained with the station on the island.

Grounding of the SS. 'Bengore Head.'

On October 5, 1913, the British steamer *Bengore Head* grounded near Flowers cove, in the straits of Belle Isle. This vessel was not equipped with radiotelegraph apparatus, but the news of the accident was promptly forwarded by means of our stations and, had it been found necessary, vessels equipped with apparatus would have been directed to the assistance of the disabled vessel.

Stranding of the R.M.S. 'Royal George.'

On November 6, 1912, the Canadian Northern Liner *Royal George*, Bristol to Quebec, ran ashore on Isle d'Orleans. There was no danger of loss of life and the passengers were transferred to Quebec without difficulty.

At first it was considered that the position of the vessel was very precarious, and she was abandoned to the underwriters shortly after the stranding occurred. These earlier fears were not realized, and she was successfully refloated and proceeded to Quebec under her own steam on 23rd November.

During the whole of the time she was ashore, the ship was in constant communication with our Quebec station, as well as with the wrecking steamer *Lord Strathcona*, and all the arrangements in connection with the transfer of the passengers and salvaging operations were made by wireless.

Grounding of the SS. 'Uranium.'

On January 12, 1913, at 11.05 a.m., the British steamer *Uranium* bound for Halifax, grounded near Chebucto Head at the entrance of Halifax harbour. Communication was immediately established with the Camperdown station and information of the disaster transmitted to the agent of the Marine and Fisheries Department and of Lloyd's at Halifax, N.S., the life saving station at Duncan's cove also being notified.

The passengers, about 1,000 in number, were taken off and landed in Halifax by the C.G.S. *Lady Laurier* and the SS. *Bridgewater*, without loss of life.

The *Uranium* remained aground until 2 a.m., on January 17, when she was re-floated and proceeded to Halifax under her own steam.

During the whole of the time the vessel was ashore she was in constant communication with the Camperdown station, and all arrangements regarding the transfer of the passengers and salvage of the vessel were made by wireless.

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Loss of Propeller by SS. 'Mexico.'

On January 29, the Sable Island station was advised that the French steamer *Mexico*, latitude 40.45 north and longitude 58.30 west, had lost her propeller and that the SS. *Galilio* was standing by.

All vessels within range of the station were immediately notified and the disabled steamer was shortly afterwards picked up by the *Devonian*, who towed her to Halifax, encountering very rough weather on the way.

Both liners were in constant communication with the Sable Island and Camperdown stations until they reached port.

Report of Menace to Navigation by SS. 'Montfort.'

On February 15, the C.P.R. liner *Montfort* advised the Sable Island station that she had passed a spar projecting about six feet out of the water and evidently attached to submerged wreckage, in 43.09 north and 57.12 west.

The information was forwarded to the agent of Marine and Fisheries at Halifax, N.S., and all vessels, in communication with the station during the next few days, were warned.

Accident to the SS. 'Cayo Romano.'

On March 26, 1913, a report was received at the Sable Island station from the SS. *Bohemian* advising that that steamer had in tow the *Cayo Romano*, with a broken propeller; both vessels eventually arrived at Halifax in safety.

Accident to the SS. 'Abessinia.'

On January 12, the White Star liner *Cedric* advised the Sable Island station that she had spoken to the steamer *Abessinia* the day previous, and reported her as having rudder disabled and shaft broken.

The injured vessel was within the range of the Sable Island station, but, as she was not equipped with wireless apparatus, no communication could be effected with her.

The *Abessinia* finally arrived at Halifax under her own steam.

GREAT LAKES.

Accident to SS. 'Assiniboia.'

On November 3, 1912, the Canadian Pacific Railway steamer *Assiniboia* lost two propeller blades whilst crossing lake Superior.

The vessel was in constant touch with our stations at Sault Ste. Marie, Ont., and Port Arthur, Ont., until she reached port under her own steam.

Grounding of the SS. 'Easton.'

On December 5, 1912, the SS. *Easton* ran ashore in lake Superior, and remained aground for forty hours. Communication was immediately established with our Port Arthur station and maintained until the vessel was refloated.

WEST COAST.

No disasters occurred on the West Coast during the year, but the following incidents in which the wireless service participated may be of passing interest:—

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Schooner 'Washington.'—On July 31, 1912, the United States fishing schooner *Washington* was two miles south of our Estevan wireless station with a broken tail shaft. She was not equipped with wireless apparatus, but the captain came ashore to the station to telegraph for assistance. A message was immediately transmitted to the captain of the United States Revenue Cutter *Snohomish* which proceeded to Estevan and picked up the disabled vessel the same day.

Schooner 'Maria Theresa.'—On December 2, information was received over the telephone at our Pachena wireless station to the effect that a large four-masted schooner had run ashore during the preceding night at Jordan river. The Bamfield Life Saving Station, the United States station at Tatoosh, our Victoria station and the SS. *Tees* were immediately advised and the schooner was floated in the early hours of the following morning by the tug *Lorne*, with the United States Revenue Cutter *Snohomish* in attendance.

SS. 'Pleiades' (U.S.A.).—On August 16, 1912, at 3.30 a.m. a distress signal was received at our Pont Grey station from the SS. *Pleiades*. The station stood by but no further call was received from her. A United States naval station commenced working shortly afterwards and appeared to get in touch with the vessel.

Schooner 'America.'—On September 2, 1912, five men landed at the Triangle Island station from the fishing schooner *America*, of Seattle.

While the vessel was some fifteen miles southwest of the island their engine batteries gave out and they were being carried seaward in a strong tide. These men rowed ashore and brought a storage battery which they desired to have recharged and also asked if our officer could supply them with some recharges for a primary battery. The case appeared to be an urgent one, as the barometer was low and if the storm which appeared imminent had arisen, the schooner would have been blown out to sea. Their storage battery was accordingly charged and they were supplied with primary recharges out of our stock.

THE INTERNATIONAL RADIOTELEGRAPHIC CONFERENCE.

The first Radiotelegraphic Conference met at Berlin in 1903. No convention was signed at that time, but a general protocol was drawn up as a basis for discussion at a future conference.

In 1906 it became evident that on many points in connection with maritime wireless telegraphy an international agreement was urgently required, and a second conference, known as the Berlin Convention, was called again at Berlin in that year. The primary object of the convention was to facilitate ship-to-shore communication and its main provisions may be classified generally as follows:—

The acceptance and transmission of telegrams.

The adoption of uniform rules of working.

The provision of means for the collecting of charges and settling of accounts between the different countries.

Arrangements for the publication of all information necessary for intercommunication.

Rules to prevent interference and confusion in working, with adequate provision for their enforcement.

Compulsory intercommunication with certain exceptions.

Provision was also made for the establishment of an International Bureau to overlook the distribution of radiotelegraphic information. The Berlin Convention was ratified by all the leading nations of the world, including Great Britain and all her self-governing colonies.

The next Convention of the International Radiotelegraphic Conference was scheduled to take place in London, Eng., during 1911, but, on account of the coronation, was postponed until June, 1912. The London Conference eventually met on the fourth day of June, 1912, and continued in session until the fifth day of July.

The Dominion of Canada was represented by G. J. Desbarats, Deputy Minister of the Naval Service, and the undersigned, who were regularly appointed as delegates by Order in Council No. P. C. 1021, dated 25th April, 1912.

Mr. Desbarats received from His Majesty plenipotentiary powers authorizing him to negotiate and sign a Radiotelegraph Convention on behalf of the Dominion of Canada with the other nations represented at the conference.

It is understood that this is the first time a treaty has ever been signed for Canada by her own representative as distinct from a treaty signed by Great Britain for Canada. At the Radiotelegraph Conference, Canada and the other Dominions took their places as independent units, discussed the questions raised and voted on the various proposals from their own standpoint; the Dominion representatives taking action quite independently of the members of the British delegation.

Representatives of the following countries were present:—

Argentina,

Austria,

Hungary,

Bosnia-Herzegovina,

Belgium and Belgian Congo,

Brazil,

Bulgaria,

Holland,

Dutch Indies and Curacao,

Italy,

Japan,

Monaco,

Morocco,

Norway,

Denmark,	Peru,
Egypt,	Portugal,
France and various French possessions,	Roumania,
Germany,	Russia,
Great Britain,	San Marino,
Australia,	Siam,
Canada,	Spain,
India,	Sweden,
New Zealand,	Turkey,
South Africa,	United States,
Greece,	Uruguay.

All of the above countries were adherents to the Berlin Radiotelegraphic Convention, although in the case of Greece, Siam and Uruguay the adhesion was not notified until after the opening of the conference.

PERSONNEL OF THE CONFERENCE.

Of the delegates to the conference, approximately one-third were administrative officials connected with the postal and telegraph departments of the various countries represented; another third consisted of Naval and Army officers; some six per cent were members of the Diplomatic Corps of certain of the countries represented, while the remainder included eminent scientists and other persons of prominence interested in the development of the art of radiotelegraphy.

In addition to the above, representatives from the different radiotelegraph companies of the various countries were permitted to attend all the meetings and take part in the discussions; they were not, however, accorded the right to vote.

Three main committees were appointed, and by far the greater part of the work was handled by their members. Canada was represented on both of the main committees, known as the 'Commission du Règlement' and the 'Commission des Tarifs.' These committees were composed of representatives from twenty-two and twenty countries respectively.

The third committee, known as the 'Commission de Rédaction,' was entrusted with the revision and drafting of all proposals adopted by the conference, and was composed of the representatives of five countries.

Prior to the assembling of the conference, some two hundred proposals for amendments to the provisions of the Berlin Convention were submitted to the International Bureau, where they were printed and distributed to the different Administrations for their consideration.

Amendments were also submitted from time to time during the proceedings of the conference, and, in all, some three hundred proposals were considered.

The first work of the conference was the allotment of the votes to colonial possessions as prescribed in Article XII of the Berlin Convention, and during the London Conference the voting power of the various countries and their dependencies was as follows:

Great Britain.. . . .	6
France.. . . .	6
Germany.. . . .	4
Holland.. . . .	3
Portugal.. . . .	3
Belgium.. . . .	2
Japan.. . . .	2
all other countries.. . . .	1

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The chief points dealt with by the London Conference were generally as follows:—

INTERCOMMUNICATION.

The principle of compulsory intercommunication between ship stations and between ship and shore stations, irrespective of the systems employed, was accepted by all the Administrations represented, including Great Britain, Portugal, Japan and Italy, the four nations who refused to subscribe to this principle in the Berlin Convention.

The principle of compulsory intercommunication between shore stations was not accepted and it was not deemed advisable to formulate regulations to govern the working of such stations until their number demanded it, and the matter was therefore postponed for the consideration of a future conference.

At the same time, a clause was inserted in the London Convention stating that stations established for communication between shore and shore should not refuse to exchange traffic with similar stations merely on account of difference in the systems of radiotelegraphy employed at such stations.

AERIAL STATIONS.

The regulation of stations installed on balloons or aeroplanes, which was proposed by the Italian delegation, was not considered necessary at the moment, and the matter was therefore postponed for consideration at the next Conference.

COMPULSORY EQUIPMENT.

At the third plenary sitting of the conference, a discussion took place respecting the compulsory equipment of wireless apparatus on vessels but the conference, while declaring itself in favour of the principle, considered that the matter was beyond their province and one rather to be decided by the Different Administrations themselves. Neither did they venture an opinion as to what classes of ships should be compelled to equip. The fact that the 'International Conference for Safety at Sea' was scheduled to meet in London in 1913 to discuss and make recommendations on this and similar questions, doubtless had some influence in this decision. At the same time, the conference adopted and included in the regulations annexed to the convention, certain sections dealing with the watches to be maintained by different classes of ship stations; the class of operators to be carried and the installation of emergency apparatus.

CLASSIFICATION OF SHIPS.

Ships equipped with radio apparatus must have a license therefor from the government whose flag she flies, and in the license the classification of the ship must be indicated.

Class I.—Ships in the first class will be required to maintain a constant watch, to carry an emergency equipment capable of working for six hours with a minimum range of eighty miles, and a staff of not less than two operators holding first-class certificates.

Class II.—Ships in the second class will be required to maintain a watch during certain specified hours and in addition a watch for the first ten minutes of every hour not included in those specified. She must carry an emergency equipment as specified for Class I, with the exception that the minimum range is reduced to fifty miles; the station must be in charge of an operator

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holding a first-class certificate with either a second-class operator or a watcher to maintain the required service during the 24 hours.

Class III.—Ships in the third class are not required to maintain any fixed hours of watch, and they will in general be fishing boats and others of like character. Ships in this class are not required to carry any emergency equipment, and an operator with a second-class certificate may be placed in charge of the equipment so long as its use is limited to the business of the ship. Should she desire to engage in public correspondence, then a first-class operator must be provided.

WAVE LENGTHS.

Every shore station must be capable of working on wave lengths of 600 and 300 metres, one of which must be notified as the normal wave length of the station.

Every ship station must also meet with these requirements with the exception that the normal wave length is fixed at 600 metres unless it is physically impossible to so equip the ship, in which event a wave length of three hundred metres may be employed.

The wave length of 150 metres has been reserved for the use of radiophares.

Wave lengths between 600 and 1,600 meters are reserved exclusively for naval and military purposes.

Any ship or coast station working on wave lengths other than 600 metres must cease working at the end of each quarter of an hour and stand by for three minutes on the normal ships' wave length.

LONG DISTANCE TRANSMISSION.

The principle of the Berlin Convention that a ship station must always work with the nearest coast station, except under special circumstances, would appear to have been very liberally interpreted by stations in Europe, and after a lively discussion the conference finally adopted rules which will permit a ship to communicate with a coast station, other than the nearest, provided the following somewhat drastic provisions are complied with:—

1. The ship and shore station must be of the same nationality.
2. The wave length used must be 1,800 metres at both stations.
3. The ship must be not less than fifty miles from the nearest coast station, unless the power used is less than 5 K.W., in which event the distance is reduced to twenty-five miles.
4. The radiotelegrams transmitted must be destined for the country in which the coast station is situated.

CLASSIFICATION OF OPERATORS.

Under the Berlin Convention only one class of operator was provided for and each Administration was required to furnish each operator with a certificate certifying that he was duly qualified in the adjustment of apparatus, had a knowledge of the regulations applying to radiotelegraphy and was capable of transmitting and receiving at a minimum speed of twenty words per minute.

Under the London Convention the establishment of a second class of operators was provided for; such operators to have the same qualifications as those of the first class, with the exception that the minimum operating speed is reduced to twelve words per minute.

CONTROL.

A new provision stating definitely that 'the captain of a ship has absolute authority over the operation of any wireless station aboard his ship' was included

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in the Convention in order to clear up any misapprehensions that might exist on this point.

ACCOUNTING AND TRAFFIC ARRANGEMENTS.

In addition to the business which may be accepted by stations under the Berlin Convention, certain other classes of messages were admitted by the London Convention:—

- (a) Messages with prepaid replies.
- (b) Paid service advices.
- (c) Messages to be mailed at a port of call.

Many improvements with a view to the simplification of accounting methods were made in the existing regulations, and certain new regulations to cover the retransmission of telegrams by ship and shore stations were included. The latter point was subject to much discussion, and it was finally decided to limit the number of transmissions to two, and to allow each retransmitting ship and coast station a single charge for the re-transmission of each message.

METEOROLOGICAL AND TIME SIGNALS.

Regulations were included to cover the handling of meteorological messages and time signals. In general, all Administrations will take the necessary steps to provide their coast stations with meteorological and other information of importance to navigation; the same is to be embodied in telegrams not exceeding twenty words in length and is to be transmitted to all ships on request. In the absence of special arrangements the charges applicable to ordinary messages will also apply to this special business. The time occupied in the transmission of any group of time signals or meteorological telegrams must not exceed ten minutes.

SPECIAL RESERVATION BY THE CANADIAN ADMINISTRATION.

Under the terms of the Convention the 'ship charge' must not exceed 40 centimes a word, but may be anything less than this amount, while the 'coast charge' must not exceed 60 centimes a word.

The total charge on a regular telegram is made up of the 'ship charge' the 'coast charge', and the 'land line charge' for delivery, and it will be observed that if the ships exercise their option and fix their 'ship charge' at amounts varying from zero to the maximum allowed, we are confronted with the peculiar situation that the total rate from, say, Montreal to eight different ships at sea via Father Point station might have eight different values; this, in spite of the fact that the 'coast station' rate from Father Point to the ship and the 'land line charge' from Montreal to Father Point remain the same.

The commercial companies operating practically all of the land lines in North America had under consideration, at the time of the Convention, a proposal to handle radiotelegrams on a cable count basis instead of on American count, and as it would have been out of the question for us to ask them, in addition, to file at their many thousands of offices the individual ship rates of all the ships carrying wireless apparatus, which might, at some indefinite time, desire work with our stations, the Canadian delegates submitted a reservation to the effect that the Canadian Administration must be given power to fix the total radio rate on outgoing business (that is business destined for a ship) via each of its coast stations, the ship to be credited with two-fifths and the coast stations with three-fifths of this radio rate, irrespective of what 'ship charge' may have been filed with the International Bureau for the ship, this reservation to apply to business originating at

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offices in North America only. The exact wording of the reservation was as follows:—

‘Le Gouvernement du Canada se réserve la faculté de fixer séparément pour chacune de ses stations côtières, une taxe maritime totale pour les radio-télégrammes originaires de l’Amérique du Nord et destinés à un navire quel-conque, la taxe côtière s’élevant aux trois-cinquièmes et la taxe de bord aux deux-cinquièmes de cette taxe totale.’

On our return to Canada negotiations with the land line companies, in connection with adoption of the International method of counting, were brought to a successful conclusion, and the new method was officially adopted on December 1, 1912, at all telegraph offices in North America.

One through radio rate for each of our stations has been filed with these companies, and we are now able to comply with the provisions of the Convention in all respects.

Our foresight in obtaining the consent of the Conference to our reservation became very apparent during the above-mentioned negotiations, and had we not been provided with the power to fix a rate, it is very probable that the International method of counting would never have been accepted by the land line companies.

At the same time, the amount of trouble the reservation has saved everyone concerned in the matter of bookkeeping, etc., is incalculable.

LEGISLATION.

On December 6, 1912, the Minister of the Naval Service introduced in the House of Commons, Bill No. 26, entitled ‘An Act respecting Radiotelegraphy.’

The Bill, having received its first and second readings was, in due course, referred to the Select Committee on Marine and Fisheries, Mr. C. Jamieson, M.P., Chairman, which after hearing evidence, reported it back to the House with some amendments.

It was read for the third time in the House of Commons on April 29, 1913, and, having been passed through the Senate and received its third reading there on May 23, finally became law on June 6, 1913.

This Act, which is known as the ‘Radiotelegraph Act’ cancels all existing radiotelegraph legislation (Part IV of the ‘Telegraphs Act,’ chapter 126, R.S.C., 1906) and, in general, places the absolute control of radiotelegraphy in all its phases, in the hands of the Minister of the Naval Service.

In addition to ordaining the compulsory equipment of radiotelegraph apparatus on certain classes of steamers, this Act is framed so as to ensure the regulating of radiotelegraphy in its present state, and also, as far as is possible, to provide for future developments, and is, in every way, the model of what radiotelegraphic legislation should be.

The main provisions of the Act, with their bearing on the general wireless situation, are as follows:—

LICENSED STATIONS.

Under section 3, no radiotelegraph station of any description may be installed or operated on board any Canadian ship or at any point within the Dominion of Canada, except under a license granted therefor by the Minister of the Naval Service.

Penalty.

The penalty for violation of the above is a fine not exceeding \$500 or twelve months imprisonment.

This section is practically the same as section 40 of the Telegraphs Act and, in effect, places the control of all stations absolutely in the hands of the Minister.

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since no person may operate a station except under a license, and the Minister has power to include such regulations in this license as he may see fit.

COMPULSORY EQUIPMENT OF RADIOTELEGRAPH APPARATUS ON CERTAIN VESSELS.

Section 4 provides that on and after January 1, 1913, passenger steamers covered by the following provisions must be equipped with radiotelegraph apparatus with a minimum range of 100 miles:—

- (a) Vessels licensed to carry 50 or more persons, and plying between ports more than 200 miles apart;
- (b) Vessels licensed to carry 250 or more persons and plying between ports more than 90 miles apart;
- (c) Vessels licensed to carry 500 or more persons and plying between ports more than 20 miles apart.

Subject to the following exceptions:—

- 1. Vessels plying on the rivers of Canada;
- 2. Vessels plying on all the lakes of Canada except Lake Ontario, Lake Erie, Lake Huron, Lake Superior;
- 3. Vessels plying on the Georgian bay;
- 4. Vessels calling at Canadian ports for the sole purpose of obtaining bunker coal or provisions for their own use, through stress of weather, or for repairs.

Special exemptions from the provisions of Class (c) were made in the case of steamers plying on the Great Lakes whose regular routes are not, at any point, more than seven miles from the shore, and in the case of steamers plying on the Northumberland strait.

The question of the compulsory equipment of vessels has been engaging the attention of the different Governments for some time past and there is so doubt that it is now generally accepted as a principle, by the leading nations of the world, owing greatly to the part played by radiotelegraphy in the *Titanic* disaster.

Just what classes of steamers should be compelled to equip is a very debatable point, and the nations which have adopted the principle up to date have, in general, confined it to vessels making trans-oceanic voyages, that is to say, the class of vessel affected by clause (a) of our legislation.

The Bill, when first introduced before Parliament, affected this class of vessel only, but, in order to comply with the wishes expressed by members on both sides of the House, on the occasion of the first reading, the provisions were amended by the insertion of clauses (b) and (c), which, it will be noticed, have considerably extended the sphere of the compulsory clauses.

As finally enacted, the Bill affects, not only liners making long voyages, but vessels undertaking short ocean trips, as for instance between Nova Scotia and Newfoundland, and also boats undertaking what are practically long-distance ferry services, such as those between Toronto and Niagara, Victoria and Vancouver, and St. John and Digby.

In all, some forty-one steamers of Canadian register will be affected, as follows:—

Clause (a)—

West Coast.	4
Great Lakes	11
East Coast.	6

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Clause (b) —

West Coast.. . . .	Nil.
Great Lakes.. . . .	2
East Coast.. . . .	Nil.

Clause (c) —

West Coast.. . . .	6
Great Lakes.. . . .	11
East Coast.. . . .	1
	—
	41
	—

The first cost of an equipment installed on a vessel is in the neighbourhood of \$3,000, in which event the ship must supply her own operator, or if desired, arrangements can be made with an operating company, to supply the apparatus and operate the station for about \$1,200 per annum.

There was, of course, considerable opposition, on the part of the ship owners, to the provisions of clauses (b) and (c) when the Bill was before the Select Committee. Their representatives were present in force to present their side of the case, and they argued that the financial burden it would place on their ships would be prohibitive. The Honourable the Minister of the Naval Service, however, in his able exposition of the provisions of the Bill before the committee, stated that—

‘It seems to me—and this is the view of the department—that if, by the installation of wireless apparatus, we can lessen the danger of those who travel by ship, it is unfair that the shipping interests should resist it because it would cost them \$1,000 per annum per ship;’

and this was evidently the feeling of the committee itself.

The Richelieu and Ontario Navigation Company, seven or eight of whose boats were likely to be affected, did their utmost to have vessels plying between Toronto and Niagara exempted. They were, however, unable to satisfy the committee that installations on these vessels were unnecessary, and both clauses (b) and (c) were finally passed by the committee and reported to the House in their present form.

The steamers plying on Georgian bay were exempted by the committee since it was proved to their satisfaction that these boats were not financially able to bear the expense of an equipment; while the exemption of boats plying on routes within seven miles of the shore on the lakes and boats plying on the Northumberland straits between Prince Edward Island and the mainland, was made, since such vessels are always within reach of well-settled shores, provided with telegraphic facilities, by which immediate aid can be obtained in case of distress, whilst, in the case of fire, they can be run ashore in a few moments and a disaster averted.

OPERATORS.

Section 6 prescribes that all operators at coast or land stations must be British subjects and must make out a declaration of secrecy, while section 11 gives power to the Minister to make regulations for the examination of operators for certificates of proficiency, to prescribe what classes of operators shall work the different ship, coast and land stations, and to fix the number of operators which must be attached thereto.

TRANSMISSION OF FALSE SIGNALS.

Under section 7, any person who transmits a fraudulent distress signal or radiogram of any kind, or who, without lawful excuse, interferes with a radio communication, is liable to a penalty of \$500 and costs, or six months imprisonment.

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This section is a very necessary one, and will enable us to take drastic measures to suppress those unthinking or malicious amateurs who have no better sense than to send out a distress call merely for their own amusement. Fortunately, we have not as yet been afflicted with this type of youth in the Dominion.

INTERNATIONAL CONVENTIONS.

Section 10 gives power to the Governor in Council to accede to any International Convention in connection with radiotelegraphy, and to issue regulations to make its provisions effective.

The effects of radiotelegraphy cannot be confined to any particular sphere of action. Electric waves take no cognizance of national boundaries and, in consequence, their control is patently one for international agreement. It is therefore of great importance that the Dominion should have power to accede to any International agreement from which we are likely to derive any benefit.

CENSORSHIP AND EXPROPRIATION OF STATIONS.

Under section 10 the Governor in Council is given power to control the working of radiotelegraph stations and to exercise a censorship over them in time of war or other emergency, and under section 13 His Majesty is given power at any time to expropriate any station for the public service, the amount of the compensation to be paid to the owners therefor being adjudicated by the Exchequer Court of Canada.

WATCHES TO BE KEPT.

Under clause (g) of section 11, the Minister may make regulations prescribing the watches to be kept at the different stations on ship and shore. This is a very necessary authority, particularly in the case of ship stations; ship owners are only human and practically all of them endeavour to cut down the number of operators to a minimum so as to save expense. At the same time, the operators themselves rarely stand by for a longer period than their captain compels them to and he, so long as his own messages are promptly dispatched and received, does not, as a rule, concern himself greatly with the operation of the station. He knows that should his vessel get into trouble, the operator is instantly available to call for aid; thus every one concerned loses sight of the point that it is of small use for a ship to send out a distress call unless there is some one on watch on another ship to receive it, and it would be no help to a ship in distress to have twenty vessels within range if the operators on those vessels were not standing by.

Under the regulations shortly to be issued by the department, the different ship stations will be classified; certain ships will be compelled to maintain a constant watch day and night, others will maintain a constant watch for a specified period during the day only and then a watch for the first ten minutes of every hour for the balance, whilst others, such as fishing boats, will be allowed to keep an irregular watch suited to their own requirements.

In general, the boats plying regular runs will maintain either continuous watch or watch at certain definitely known times so that everyone will know exactly when communication may be established.

EQUIPMENTS AND EMERGENCY EQUIPMENTS.

Under Section 11, clause (b), the Minister is given power to classify the different stations and to prescribe the type of apparatus and emergency equipment which shall be installed at each station.

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The importance of this clause cannot be over-estimated; the Minister, by specifying the quality of the apparatus to be used, can regulate the purity of the waves which are limited, and, since a well-tuned station emitting a slightly damped wave is much less likely to interfere with surrounding stations than one emitting a highly damped wave, much can be done towards lessening this ever present trouble of interference.

The power to compel the installation of an emergency equipment on vessels is also of far-reaching importance. In practically all ships, the power for the main radio equipment is taken from the ship's dynamo which, in case of disaster, is usually one of the first parts to give out; in fact the dynamos are generally put out of commission long before the ship is a total wreck. It is thus essential that every ship should carry a self-contained emergency equipment located on an upper deck out of reach of harm, and capable of operating for at least six hours with a range of about 100 miles. In this way communication can be established and aid secured long after the dynamos have failed.

COMPULSORY INTERCOMMUNICATION.

Clause (j) section 11, gives power to the Minister to compel all radiotelegraph stations to intercommunicate with one another.

The chief aim of this section is to prevent the establishment of a monopoly in radio-telegraphy.

This power is perhaps not as necessary at this moment as it was some years ago when the Marconi Company were making their big fight against the Berlin Convention, and endeavouring to establish a monopoly by refusing to permit their stations to intercommunicate with any stations equipped with a system other than Marconi's.

In this reference it is of interest to note that the Marconi Company have entirely withdrawn from this stand, and at the London Convention in 1912 they publicly announced that, in future, all ships and coast stations owned and operated by them would intercommunicate with all other stations, irrespective of the system employed.

I have the honour to be, sir,

Your obedient servant,

C. P. EDWARDS.

General Superintendent, Government Radiotelegraph Service.



Their Royal Highnesses The Duke and Duchess of Connaught, with their staff and the Officers and Crew of H.M.C.S.
"Earl Grey," July, 1912.



First Term Cadets at R. N. College, Halifax.



Third Term Cadets at R. N. College, Halifax.



The Royal Naval College of Canada at Halifax N. S.



TEMPORARY TIDAL STATION showing a scale and tide column with shelter box on top which contains the Recording Instrument, at Bonne Espérance near Belle Isle Strait.



MERIDIAN INSTRUMENT by which accurate time is obtained direct from the sun for tidal observations in isolated localities.



HUDSON BAY AND STRAIT

*Showing the path followed and the ice encountered
by the H.S.S. Minto during her trip to Port Nelson
1912*

Captain F. Anderson
Officer in command

under the orders of

Honourable J. D. Hazen Minister of the Naval Service of Canada

G. J. Desbarats Deputy Minister





HUDSON BAY AND STRAIT

*Showing the path followed by the H.S.S. Minto
during her return trip from Port Nelson
1912*

Captain F Anderson
Officer in command
under the orders of

Honourable J. D. Hazen Minister of the Naval Service of Canada
G. J. Desbarats Deputy Minister

Explanation of Signs
----- Ship's track





LINES OF EQUAL MAGNETIC DECLINATION
IN EASTERN CANADA, 1912

Data for Hudson Bay and Strait from Magnetic Survey

by W. E. W. Jackson, M.A.

under the orders of

HON. J. D. HAZEN

Minister of the Naval Service of Canada

G. J. DESBARATS

Deputy Minister

Scale of nautical miles
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480 490 500 510 520 530 540 550 560 570 580 590 600 610 620 630 640 650 660 670 680 690 700 710 720 730 740 750 760 770 780 790 800 810 820 830 840 850 860 870 880 890 900 910 920 930 940 950 960 970 980 990 1000

